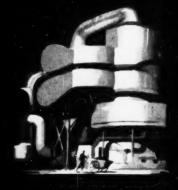
MARCH 1954

Chemical Engineering



What new technology this year? How much money for new facilities?

What action in Washington? Reaction in industry?



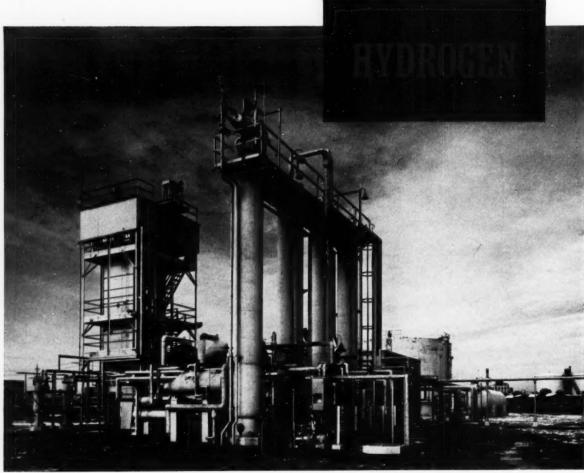
How about the supply and demand . . .

... of materials? ... of manpower?

What outlook for process industry profit?

., and yours?

See THE CHALLENGE of '54 page 177



At new Chicago plant of The Southern Cotton Oil Company

Hygirtol plant produces high purity hydrogen continuously

This GIRDLER HYGIRTOL* PLANT provides a continuous supply of hydrogen of a purity exceeding 99.8%. Operation of the plant is practically automatic, clean, safe, instrument-controlled, and its output can be varied readily from 50% to 110% of rated capacity.

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For the 31st Time

This year, for the 31st time, we're publishing what's usually known as our "annual review-and-forecast" report. You'll find it in this issue as The Challenge of '54.

It all started back in 1924—we were Chemical & Metallurgical Engineering then—when our editors began a "pioneering effort" to get and publish facts and figures on the U. S.'s young chemical industry.

Times have changed a lot since 1924. So have our reports. But the series continues unbroken.

Our entire staff—some 19 of us pitches in to turn out a job like the one you see this month.

We call on our field editors in Chicago, San Francisco, Houston, Washington. We use McGraw-Hill's staff of economists and its network of news men in 55 cities throughout the U. S. We talk to industry leaders, government men, consultants, educators, labor leaders, bankers.

All in all, some 230 people chipped in to help make the Challenge of '54 in this issue.—IRC.

.... 1954's challenges will show up in technology, sales, all along the line.

So here's our 32-page roundup of what happened last year, what's in the cards this year and next.

We take a hard look at technology and its shifting trends, show what's happening to plant expansions, predict the way political winds will blow, point up the delicate supply-demand balance, brief the status of 16 key commodities. (Report)



Here's a new tool for engineers.

It's called a micro-interferometer and it measures surface flaws so small that "Marilyn Monroe would look like one of Macbeth's witches." You can use it to explore the surfaces of paints, fibers, films and metals. (Article)



Speed up design of jacketed vessels.

At last: A nomograph that'll make it easy to size your jacketed vessels. It ties in



Please turn page

GUIDED TOUR

volume, heat transfer area and vessel shape.

Just pick off your answers. (Article)



What's happened to equipment costs?

Are they—at long last—leveling off? Yes, but they'll still bear watching. These charts show you exactly what's happened in chemicals, petroleum, paints, paper and other industries. (Article)



More heat exchanger shortcuts.

Gilmour's back with his sixth article on shortcuts to heat exchanger design. This month's bag of tricks—used with success for 15 years—will interest all chemical and petroleum engineers. (Article)



You haven't seen these before . . .

... a cylinder dryer that varies its crosssection, dries without scorching ... a metal box for shipping bulk materials that collapses to 38 percent of its volume, cuts down "dead-heads." (Equipment News)



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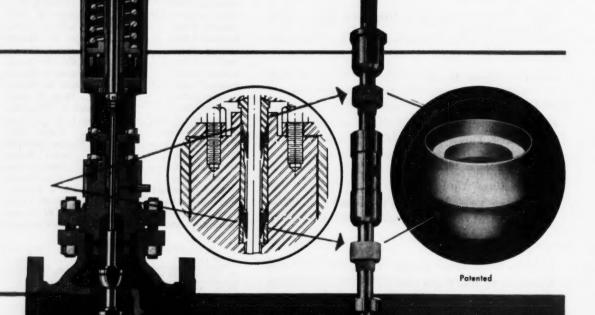
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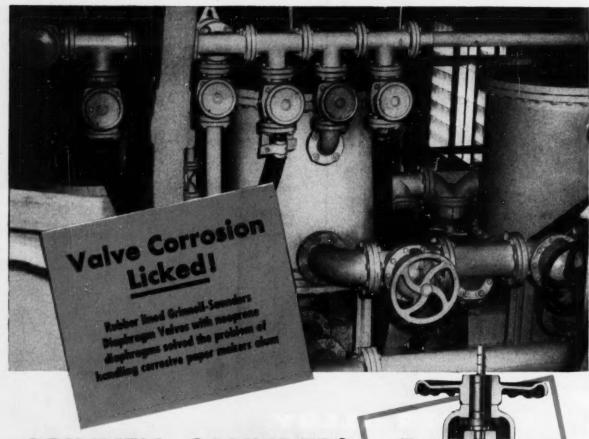
Light up your pipe and lean way back in your favorite chair. If you're troubled with a tough corrosion problem—why not let our metallurgical staff do the worrying for you.

Whether you're in need of intricate stainless castings or top quality stainless steel valves, fittings or accessories, just turn the specifications over to Cooper Alloy. Our products are produced with some over them with confidence and relative



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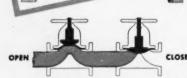
GRINNELL-SAUNDERS DIAPHRAGM VALVES

Commercial aluminum sulphate can be everlastingly troublesome, as anyone knows who has ever had to work with it. So, comparing notes with a company that handles this chemical every day of its business life may be helpful.

Northern Chemical Industries, Searsport, Me., is an important manufacturer of "paper makers alum". Northern Chemical Industries relies heavily on Grinnell-Saunders Diaphragm Valves. They have found that the wide range of body, lining and diaphragm materials available with Grinnell-Saunders valves offers flexibility in handling a wide variety of corrosive fluids.

The basic design of the valve is an advantage. Working parts are completely isolated from the fluid stream which, in the case of corrosive acids, means longer valve life. Also, there is the matter of economy. With Grinnell-Saunders Diaphragm Valves, it is usually possible to go to less expensive body materials, to which special body linings can be added. Replacement and maintenance expenses, moreover, are greatly reduced.

Originally designed and ideally suited for air and water service, Grinnell-Saunders Diaphragm Valves also are recommended for almost every regular or special service. This is backed up by the excellent performance records achieved by valves now in use.



Features of Grinnell-Saunders Diaphragm Valve:

Diaphragm absolutely isolates working parts from fluid

Diaphragm lifts high for streamline flow in either direction

Diaphragm presses tight for positive closure Body, lining and diaphragm materials to suit service



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B. F. Goodrich Chemical raw materials



B. F. Goodrich Chemical Co. does not coat these controller parts. We supply only the Geon raw material.

TEMPERATURE CONTROLLER PARTS PROTECTED FROM ACID!

YOU need a concentrated phosphoric acid solution to reveal cracks, etc., in defective jet engine blades—but this can mean trouble for the temperature regulator controlling the acid bath.

The bulb and capillary of the regulator is immersed in the bath. Formerly, these ordinary stainless steel or lead-coated elements couldn't stand the acid; they would last two or three months and short out.

The engineers tried coating these elements with a plastisol made from Geon paste resin. It works perfectly—the plastic coated parts show no deterioration after a year's steady use!

This example may give you an idea for developing or improving more saleable products. For Geonbased plastisols—and other Geon resins, latices and compounded plastics—have many applications. They may be used in coating, dipping, casting or molding operations to provide resistance to many chemicals, oil, grease, heat, cold and abrasion. We'll help you select the Geon material best suited to

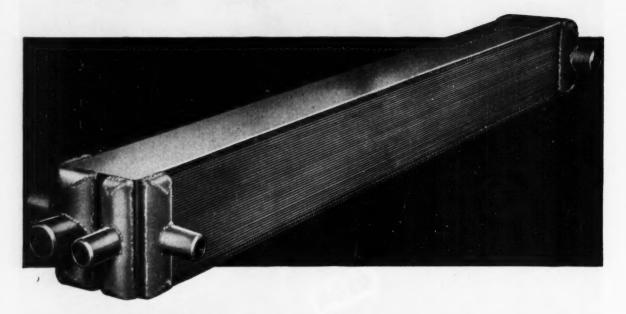
your needs. For technical information, please write Dept. GE-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



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How to take the <u>plus</u> cost out of <u>minus</u> temperatures even at -350°



Is many applications, Trane Brazed Aluminum Heat Exchangers have licked the problem of excessive cost in low temperature heat transfer. Fabricated entirely of aluminum, they take full advantage of aluminum's higher thermal conductivity, its improved strength and high ductility at low temperatures. This, plus the inherently higher performance characteristics of the Trane Brazed Aluminum Surface design, produces a heat exchange unit that is lighter, more compact, far more efficient—and far less costly—than conventional equipment.

In many instances, Trane Brazed Aluminum Heat Exchangers have taken only one-third the space, weighed only one-fourth as much, as conventional exchangers. Yet, for all their light weight and compactness, these rugged units have the ability to operate at working pressures up to 450 lbs. p.s.i. at lowest temperatures.

Because of their economy, and because of their

ability to operate dependably at temperatures as low as -350 degrees and still pack as much as 450 square feet of surface into a single cubic foot of lightweight space, TRANE Brazed Aluminum Surfaces are ideally suited for low temperature applications such as ammonia, oxygen, helium, nitrogen and argon processing.

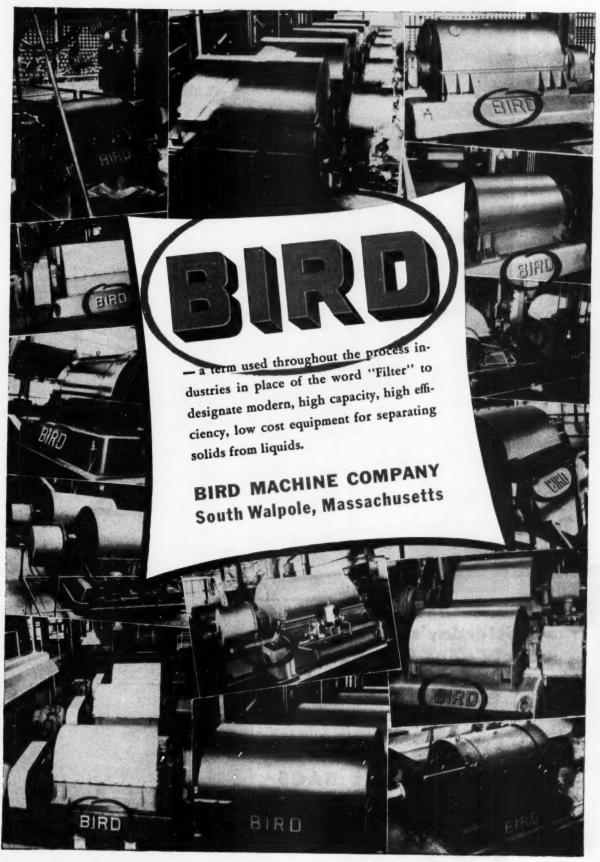
For that matter, Trane Brazed Aluminum should be your first consideration for any difficult heat transfer application requiring close temperature approaches, multi-stream exchange, or low temperatures.

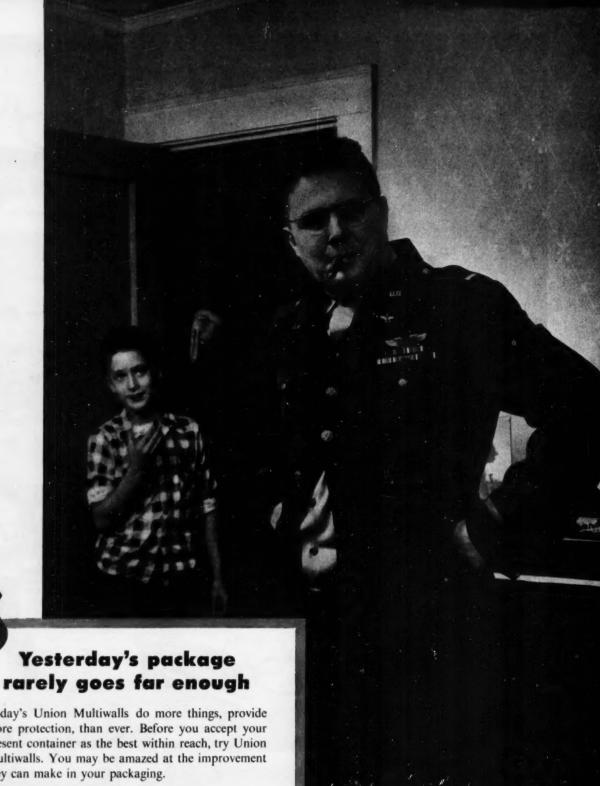
If you have a heat transfer problem, now is the time to call in Trane. Our 30 years' experience in various types of heat transfer, and our engineering facilities, are always at your disposal. And for your files, get your copy of "Extended Surface Heat Transfer Equipment," showing the wide range of design possibilities. Simply contact your nearest Trane Sales Office or write to Trane, La Crosse, Wis.

TRANE brazed aluminum heat transfer surfaces

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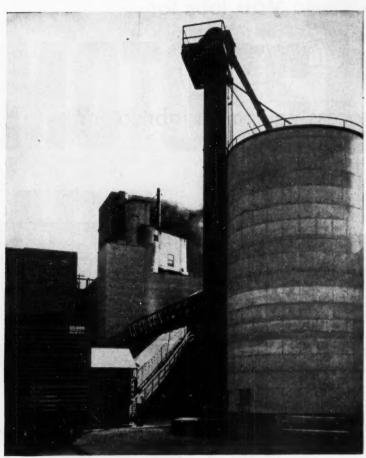


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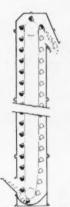
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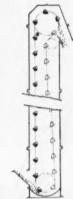
13 types...4 basic designs to meet your elevating requirements



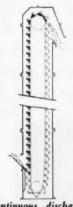
Link-Belt screw conveyor and bucket elevator handle material from railroad car to storage silo.



Centrifugal discharge for free-flowing, fine or loose materials with small to medium lumps.



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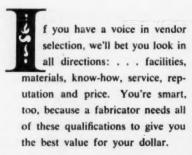


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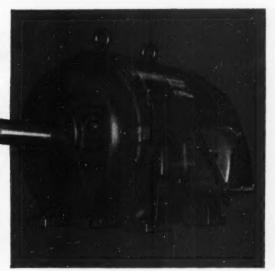
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15



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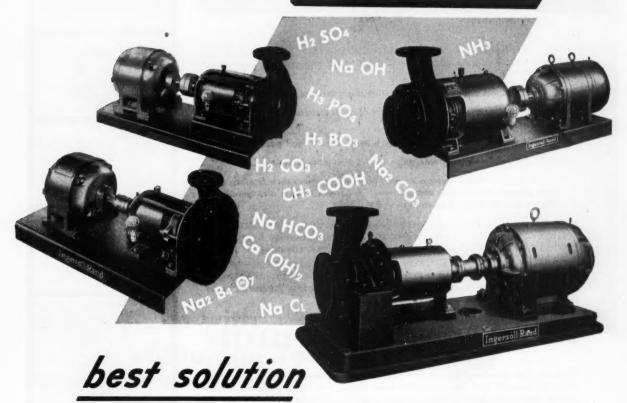
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- 2. Pelleting helps preserve original moisture content, chemical analysis and other properties.
- 3. Pelleted materials flow freely, can be binned, sacked, and packaged easily.
- 4. Hard, shiny pellets have greater sales appeal than loose material.
- 5. Densifying materials-in-process through pelleting improves their filtering qualities, permits granulating, and decreases dispersion rate. It also greatly increases density, facilitating storage and shipment.

Such materials as ammonium chloride, insecticide dusts, clay, citrus meal for use as an antibiotic carrying agent, fertilizer, granular hygroscopic products, and many others are often pelleted to great advantage.

Let a Sprout-Waldron Man survey your products and processes-without cost or obligation-with an eye to increasing your profits. Sprout-Waldron's equipment and vast experience in adaptioneering pelleters for use in many fields may be of value to you. Write for details!

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Quiet V-belt drive.

Exclusive hinged die casing for easy access.

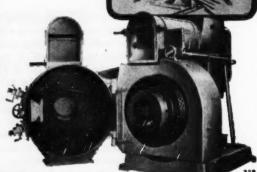
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Revolving die cover and material-lifting flights assure long roll life . . . greater capacity.

Entire mill uses only 4 standard main bearings. Overall height, only 5 ft.

(A smaller sized model is also available.)

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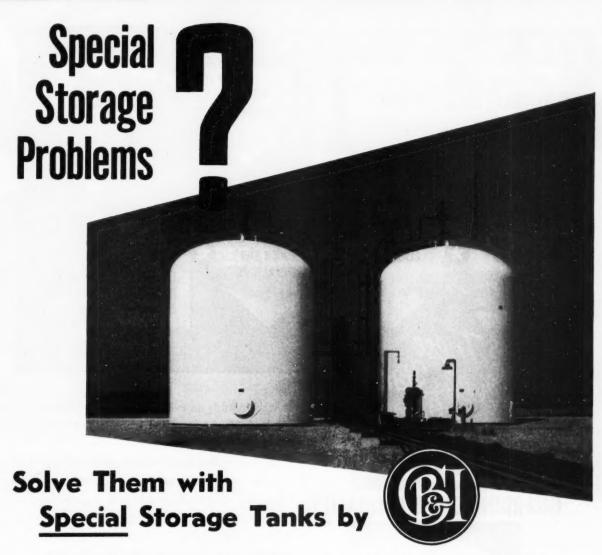
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Many manufacturers have special storage problems in connection with finished products or materials used in manufacturing processes. Materials of a corrosive or volatile nature make it necessary to provide storage facilities that will prevent contamination or evaporation.

Chicago Bridge & Iron Company is equipped to design, fabricate and erect steel plate structures to solve whatever special storage problems your products or supplies may present. Special construction and exacting specifications offer no obstacles to our experienced engineers, fabricators and erection crews. Our shops have complete equipment for stress-relieving and x-raying to meet code requirements. We also have facilities to pickle and paint fabricated steel plates by the Horton® phosphoric acid process.

Chicago Bridge & Iron Company builds flat-bottom storage tanks, elevated water tanks, Hortonspheres, Hortonspheroids, Vaporspheres, Horton Floating Roofs and special structures of aluminum or stainless steel. We can also furnish carbon steel structures clad with non-corrosive metals or corrosion-resistant linings.

Whatever your storage problems are, CB&I is equipped to design, fabricate and erect the structures you need. Further information, estimates or quotations may be had by writing our nearest office. There is no obligation on your part.

The two tanks shown above are made of carbon steel. They are 20 ft. in diam. by 20 ft. high and hold 37,000 gals. each. Both have a 3/16 in. rubber lining and are used to store 32 per cent bydrochloric acid.

CHICAGO BRIDGE & IRON COMPANY

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RESPIRATORS



M·S·A GASFOE RESPIRATOR

Workers exposed to nuisance concentrations of organic vapors and acid gases vote this respirator tops in comfort and vision. It's very light in weight. Many report that they hardly know they are wearing it. Users like its good looks, too. The same slick lines that give this eye-appeal also keep distracting corners out of the line of vision. Workers concentrate more because they don't have that "closed-in" feeling. All parts are independently replaceable for economy. Write for details.

M·S·A DUSTFOE #55 RESPIRATOR

Here's welcome relief from the unbalanced, bulky feeling of old-fashioned respirators. Workers know the difference the instant they put the Dustfoe #55 into place. And because it's so light, so compact, and so easy to breathe through, users report increased voluntary respirator use among workers. And comfort's only part of the story. Effective filtering action, approved by the U. S. Bureau of Mines, keeps workers on the safe side of breathing hazards. Write for details.

OTHER M.S.A PRODUCTS FOR GREATER SAFETY, PRODUCTION

- EYE AND FACE PROTECTION—Acid Hood, Ear Defenders, Faceshields, Plastic Hoods, Welder's Helmets, Goggles.
- SAFETY CLOTHING—Safety Belts, Asbestos, Chrome Leather, Flame-Proof Duck, Plastic and Rubber Gloves, Aprons, Sleeves and Suits—Dynel Work Clothes.
- HEAD PROTECTION—Skullgard Hats and Caps, Glass-Fiber Hats, Combination Skullgard-Welding Shield.
- VENTILATION EQUIPMENT—Air Mover, Portable
- Blower, Ultra-Aire-Space Filter, Welding Fume Exhauster.
- ARTIFICIAL RESPIRATION & OXYGEN THER-APY EQUIPMENT—Preolator, H-H Inhalator, Preophore, Demand Preophore.
- INSTRUMENTS, DUSTS—Cascade Impactor, Electrostatic Sampler, Midget Impinger, Dust Counting Microprojector.
- INSTRUMENTS, GAS—Carbon Monoxide and Combustible Gras Indicators & Alarms, Explosimeter, Infra-Red Liquid and Gas Analyzer, Oxygen Indicator, Hydrocyanic, Hydrogen Sulphide, Carbon
- Monoxide, Sulphur Dioxide and Aramatic Hydrocarbon Detectors.
- MASKS—Industrial Gas Masks, "All-Service" Gas Mask, Hose Mask.
- OXYGEN BREATHING APPARATUS—Chemox Oxygen Breathing Apparatus, Demand Mask, Work Mask.
- RESPIRATORS—Mechanical Filter, Chemical Filter, Air Line.
- FIRST AID—All-Weather First Aid Kits and Materials, Burn Treatments, Fend Protective Hand Creams, Fire Blankets, Stretchers, Salt Tablets and Dispensers.



Call the M.S.A. man on your every safety problem ... his job is to help you



MINE SAFETY APPLIANCES COMPANY

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At Your Service: 76 Branch Offices in the United States

MINE SAFETY APPLIANCES CO. of CANADA, Ltd.

Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, New Glasgow, N.S. Representatives in Principal Cities in Mexico, Central and South America Cable Address: "AMNSAF" Platburgh

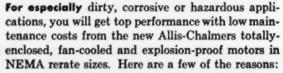
new motors-new

OPEN-DRIP-PROOF

Here are a few of the reasons why the new Allis-Chalmers open—drip-proof motor in NEMA rerate sizes will give you better performance and lower maintenance costs in general-purpose applications.

- Better protection against falling water and debris because cooling air inlets are on bottom.
- Long bearing life because large grease chambers provide plenty of reserve lubricant and are thoroughly sealed against foreign matter.
- Quieter operation, smoother performance.

TEFC and EXPLOSION-PROOF



- Foreign matter kept out of bearings and motor interior by double labyrinth seals inside and outside of bearings, and long running fits between shaft and seals.
- Bearing maintenance reduced because large grease chambers provide space for reserve lubricant; also, if required, grease may be renewed without dismantling.
- Easy to clean no inaccessible air passages.
 Dirt wipes or blows off easily.



LIFE BEARINGS - MANY TRIED AND PROVEN FEATURES

values

GET COMPLETE INFORMATION NOW Allis-Chalmers, Milwaukee 1, Wis.

Send for these bulletins:

- ☐ Open Drip-Proof, Type G, 5186210 ☐ TEFC, Type GZ, 5187225 ☐ Explosion-Proof, Type GZZ, 5187286

Address.... City and State....

ALMERS

CHEMICAL ENGINEERING-March 1954

LOW COST

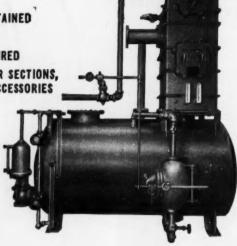
High Efficiency Deaeration

FOR SMALL AND MEDIUM SIZE POWER PLANTS

COCHRANE

U DEAERATORA C

- · FACTORY ASSEMBLED
- . COMPLETELY SELF-CONTAINED
- · EASY TO INSTALL
- . MINIMUM PIPING REQUIRED
- WIDE RANGE OF HEATER SECTIONS, STORAGE TANKS AND ACCESSORIES TO MEET ANY PLANT REQUIREMENT
- GUARANTEED ZERO OXYGEN



Here's the deaerator every small and medium-size plant has been waiting for!

Now for the first time you can get a ready-to-install deaerator that will give you high quality boiler feedwater at extremely low cost. The UNI-PAC DEAERATOR is guaranteed to deliver water with an oxygen content not to exceed 0.005 c.c. per litre (less than 7 p.p. billion)—generally recognized as zero oxygen!

The UNI-PAC DEAERATOR is designed for both right and left hand installation, and in a wide range of outlet and storage capacities. Accessory equipment is available to meet operating conditions peculiar to the plant and to obtain the results desired.

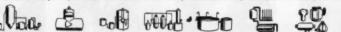
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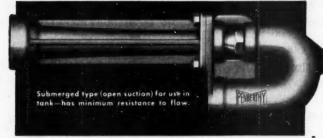
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LOW COST... COMPACT... TROUBLE-FREE...

PENBERTHY JET PUMPS









Consider the simplicity of the jet pump. It uses steam, water, air or gas under pressure to transfer or mix, without clogging, any liquid which will flow through pipes. It has no moving parts or packing glands. Needs no lubrication or maintenance. It's practically noiseless, costs little and is compact.

Penberthy makes a full range of jet pumps. They are being used in standard and unusual applications. Where necessary, they are made to withstand corrosion, contamination and high temperatures.

Penberthy, from wide experience, can help you save time and money, increase the efficiency of your operation. Take the first step by writing for Bulletin No. 512 which details the complete line of jet pumps by Penberthy.

Established 1866

PENBERTHY INJECTOR COMPANY

Division of the Buffalo-Eclipse Corporation

1258 Holden Avenue Detroit 2, Michigan

There's Certain satisfaction in PRODUCTS BY



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- EXHAUSTERS
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Building Equipped

In this Famous Scientific Institute Powers thermostatic control for heating and air conditioning systems is used in the new Dorrance Laboratory for Biology and Food Technology and in the buildings listed below.

- MAIN EDUCATIONAL AND ADMINISTRATION BUILDINGS
- **GAS TURBINE LABORATORY**
- CHEMICAL ENGINEERING BUILDING Architects: Coolidge and Carlson . Contractor: The Downey Co.
- HAYDEN MEMORIAL LIBRARY Architects and Engineers: Vorhees, Walker, Foley and Smith Contractor: Cleahorn Co.
- NUCLEAR SCIENCE LABORATORY Architects: Anderson & Beckwith . Contractor: The Merrill Co., Inc.
- SWIMMING POOL BUILDING Architects: Anderson & Beckwith Engineers: Wolff & Munier . Contractor: H. E. Whitten Co.
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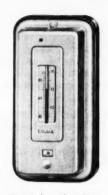
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Argonne National Laboratory . Abbott Laboratories Aluminum Co. of America . American Telephone & Tel. Co. American Optical Co. . Anheuser Busch Co. . Armour & Co. Bendix Aviation Corp. • Bachman-Uxbridge Worsted Co. Campbell Soup Company . Celanese Corp. of America Chrysler Corp. . Ford Motor Co. . General Motors Corp. Douglas Aircraft Co. . E. I. DuPont de Nemours Co. Esso Research Center . Eastman Kodak Co. B. F. Goodrich Tire & Rubber Co. . Humble Oil Co. Johns Manville Co. . Johnson & Johnson Co. Lever Brothers Co. . Eli Lilly & Co. . Lily Tulip Cup Corp. Lahey Clinic . Massachusetts General Hospital Massachusetts Mutual Life Insurance Co. Monsanto Chemical Co. . Montgomery Ward & Co. Parke Davis & Co. . Pepperell Mfg. Co. . Sears Roebuck & Co. Sharp & Dohme Inc. . Swift & Co. . Thompson Products, Inc. Wm. Wrigley Co. . Hiram Walker Inc. . Wyman-Gordon Co. New York Stock Exchange . Radio City Music Hall Madison Square and Boston Garden . Rockefeller Center



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Powers Room Type Thermostat pneumatically regulates heating and air conditioning systems. Outstanding for accuracy and dependability. Laboratory with an Exciting Future — From this modern laboratory with its excellent staff and research facilities will come great advances that will surpass the progress of the past and produce discoveries which will benefit us all.

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When you want dependable, accurate control for heating, cooling or air conditioning for any building or industrial process call Powers. With over 60 years of experience and efficient modern equipment we can help you select the best control for your requirements.

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The petroleum industry has made good use of the "divide-and-rule" formula that conquered kingdoms...to win command of the giant powers hidden in nature's oil. The industry's process engineers have transformed American life by their mastery of petroleum's secrets... and fractionating has been their master key.

These engineers' ability to develop processes which break petroleum into its component fractions has harnessed the "black gold" into a myriad forms of service. There have been other important results, too. The gigantic motor industry... America's vast network of modern highways... the services to motor travel—these are largely by-products of the petroleum process engineer's knowledge of fractional distillation.

For many years, Sun Ship has been adding to its own prestige by the service and cooperation its great shops give to the petroleum industry, and to the many other industries which call on Sun Ship's versatile engineering and construction skills. It has built... for chemical and petroleum process engineers, and for refineries throughout the world... the immense fractionating towers, pressure vessels, special machinery and heavy equipment they require. The 95'7" crude tower shown in the photograph, ready for shipment, is a representative example.

Sun Ship's services will continue to keep pace with the giant strides made by the nation's industries in the engineering progress which is steadily building a greater America.



SHIPBUILDING

& DRY

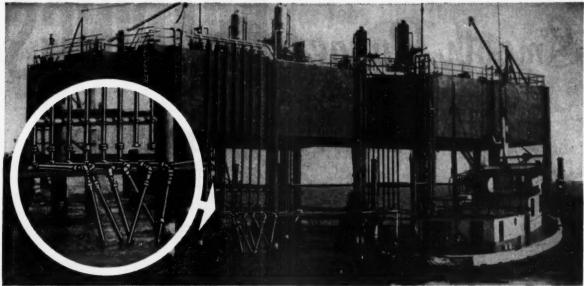
DOCK COMPANY

ON THE DELAWARE

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CHESTER, PA.

25 BROADWAY . NEW YORK CITY



Chiksan swivel joints are used on the 12 underwater lines on this portable submersible tank battery barge which stores oil from 12 wells. Three swivel joints are used on each line to provide necessary flexibility and safety against storms, wind and waves. Visible in this photograph are style 50 Chiksan joints. Style 10 and style 50 joints are below the surface.



Each submersible tank battery has a 6" or 8" CHIKSAN aluminum Marine and Barge Loading Hose that permits unloading of oil to the barges.



After 3 years of under-water service this CHIKSAN Marine Swivel Joint has been raised from 14 feet of water 13 miles from shore to service the packing.



Same CHIKSAN joint being cleaned of marine growth after re-packing and preparatory to re-submerging for years more of safe and economical service.

Davey Jones' Locker

IS FULL OF CHIKSAN MARINE
SWIVEL JOINTS...3 Years of Storms, Wind and Waves Have Proved the Flexibility, Economy and Safety of CHIKSAN Marine Swivel Joints in Submerged Salt Water Service.

In the bays along the Texas and Louisiana Gulf Coast submersible tank-battery barge storage and transfer of oil has been made both possible and practicable with the application of CHIKSAN Marine Swivel Joints to the under-water flow lines.

In waters that range from 8 to 35 feet deep and with pressures up to 2100 psi. CHIKSAN joints have given the necessary flexibility of flow lines, economy of transport and safety of operation in transferring oil for distances in excess of 13 miles under water without line rupture or loss of product. Tight bends and connections on the flow lines between well platforms, tank batteries, metering platforms or drilling structures in the operation of off-shore locations that could not withstand the "Sunday Punch" of wind, waves and dragging boat anchors, are eliminated by the use of CHIKSAN swivel joints.

CHIKSAN'S special design submersible Marine Swivel Joints have once again solved a costly and perplexing problem of the Petroleum Industry.

Write CHIKSAN Engineering and Research for complete details. Dept. 3-CE

The Flow of Enterprise Relies on

CHIKSAN

Ball-Bearing Swivel Joints

THE NEW TOOL OF MODERN INDUSTRY

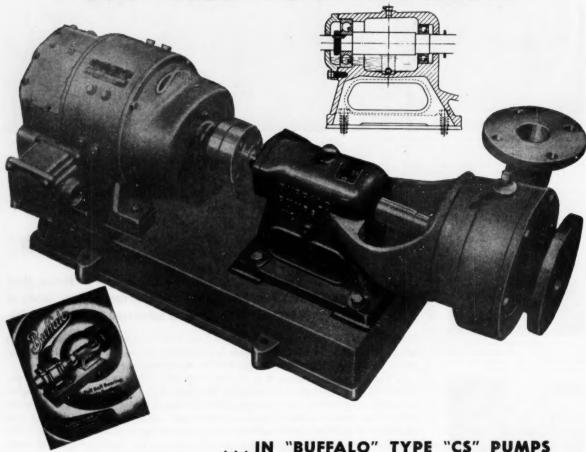


CHIKSAN Boll
Bearing Swivel Joints are
THE NEW TOOL of
Modern Industry with full
160° rotation in 1, 2, and 3
planes. Over 1,000
different types, styles,
and sizes have been
developed for prissures
and services from 28"
vacuum to 15,000 psi
ond for temperature
ranges from minus 70°
to a plus 500° F. with
packing materials for
each specific service.

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Smooth, Rugged BEARINGS

CUT YOUR PUMPING COSTS



Oversize, durable bearings in a pump can save you money two ways. First, these bearings in the "Buffalo" Single Suction Pump above are capable of handling speeds up to 5,000 r.p.m., which is more than adequate for the most severe strains which constant operation can impose on the pump shaft. This super-endurance saves you money where it counts — in pump repairs.

Secondly, a pump capable of standing high speeds can be ordered in smaller sizes. And this means substantial savings in first cost. But the real savings in "Buffalo" Type CS Pumps are in PERFORMANCE . . . on your clear water job . . . on zone air conditioning service . . . on a wide variety of chemical liquids. WRITE FOR BULLETIN 976D for details on this lower cost pumping!



BUFFALO PUMPS, INC.

501 BROADWAY

BUFFALO, N.Y.

Subsidiary of Buffalo Forge Company

Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A RETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

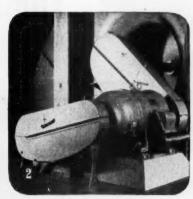
If you need a drive for jobs like these--

YOU'RE MONEY AHEAD

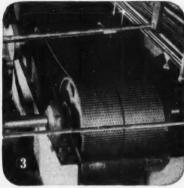
with LINK-BELT Silent Chain



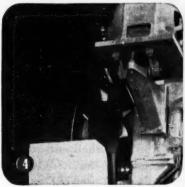
1 ADVERSE OPERATING CONDITIONS. Humidity, heat, cold do not lower Link-Belt Silent Chain's better-than-98% efficiency.



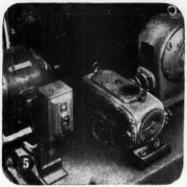
2 UNFAILING SAFETY. Dependability assures continued production. On above tunnel ventilators, Link-Belt drives protect human life.



3 LARGE OR SMALL HP. A versatile line, Link-Belt Silent Chain drives are available from fractional to thousands of horsepower.



4 LARGE RATIOS. Link-Belt Silent Chain operates efficiently on extremely short centers at ratios as high as 10-to-1.



5 LIMITED SPACE. Easy to assemble in close quarters, Link-Belt Silent Chain permits built-in drives, compact housings.



6 HIGH SPEED. After 13 years on this newspaper press at speeds up to 4700 fpm, Silent Chain is still efficient.

Here's why Link-Belt Silent Chain Drives offer you more per dollar spent:

- Lower cost—often lower in first cost, always lower in ultimate cost.
- Longer life—trouble-free performance for 25 or 30 years is common.
- · No dismantling machine or removing sheaves for repairs.
- · Better than 98% efficiency.
- · Maintained ratio assures full productive capacity.
- · Slipless action assures a better product.
- · Easy to install.
- · Safe to employees—operates in oil-retaining casing.

For all the facts, see your Link-Belt distributor or factory branch store, or write for new Book 2425.

13,440



SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

New Trailmobile Design

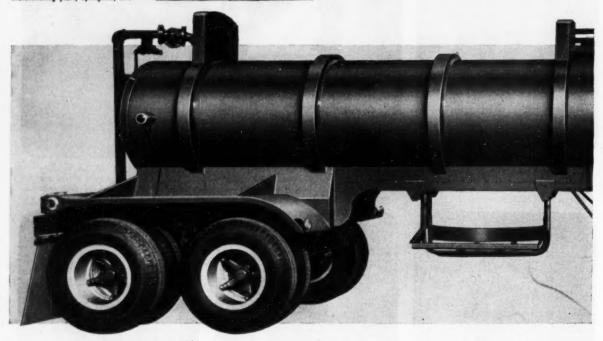


Rigid and continual inspection during assembly of Trailmobile Acid Tanks assure long service life, safe operation.

Continuous automatic weld areas can be seen on new acid tank under construction at Trailmobile's exclusive tank manufacturing plant, Springfield, Me.



The New Model



You can haul more in Trailmobile's new "slimmed down" Model CH Acid Tank Trailer. Model CH is lighter by thousands of pounds, without sacrifice of structural strength, load safety or road handling ease.

Trailmobile's weight-reducing secret is a strong tank shell of $\frac{3}{16}$ " A.S.M.E. Code Steel, girded by husky "rings of steel." Strong channel members (we call them exterior rings) are

welded integrally to the tank shell and sturdy supporting frame members. Result? Overall structural strength equal to all previous regulations! Amazing weight reduction!

This exclusive new Trailmobile Model CH design (approved by I.C.C. Specification MC-311) gives operators extra payload carrying capacity of over 100 pounds for every 100 gallons of capacity built into a tank. A 3000 gallon capacity



Trailmobile continues to build heavier gauge tank trailers. Acid tanks are available in many sizes, shapes and designs with special and optional equipment to handle exact hauling problems. Ask about these special tanks.

Gives 3000 lbs. More Payload

CH Acid Trailer ... give you extra payload carrying capacity without sacrifice of structural strength or road safety!



tank weighs almost 3300 pounds less than before. You get a bonus of 3300 pounds more payload! What's more, the new Model CH acid tanks encompass every money-saving performance feature of previous Trailmobile models: Walkway mounting brackets; adjustable fifth wheel; full Class A vapor-proof enclosed wiring; wide tunnel drains for easy cleaning; the famous Trailmobile tandem, with 4', 6' and 9' options.

Trailmobile manufactures the Model CH Acid Tank in either stainless or black steel, and with a variety of coatings and linings to handle all types of corrosive and non-corrosive fluids. So whatever your acid hauling problem, see Model CH before you buy. It's your assurance of increased hauling capacity, with utmost safety, economy and profit.

For full information and quotations on the Model CH and other Trailmobile Acid Tank Trailers, get in touch with us. Or, check the yellow pages of your phone book for the location of your nearest Trailmobile Branch Office. The Trend TRAILMOBILE is to

Subsidiary of Pullman Incorporated

CINCINNATI 9, OHIO .

SPRINGFIELD, MISSOURI .

BERKELEY 10, CALIFORNIA



SINGLE RESPONSIBILITY:

Vogt, leading builder of refrigeration condensers, assumes responsibility for engineering the unit. Only one purchase order needed.

SHOP FITTED:

To cut down field assembly labor. Requires no cutting or fitting of pipe.

Designed for today's water conservation requirements, and to keep refrigeration costs low, the *new* Vogt Condenser Tower meets the need for a proven, readily cleanable condensing unit.

The Vogt Condenser Tower consists of a multipass straight tube condenser, a receiver, an oil trap, a cooling tower, and a water pump. Removable cast iron heads permit easy cleaning of the condenser tubes.

Water costs are extremely low since the cooling water is recirculated continuously and requires only a small amount of makeup to replace losses due to windage and evaporation.

Condenser Tower units are available in capacities ranging from 5 to 50 tons refrigeration. Additional information will be furnished upon request.

HENRY VOGT MACHINE CO., Louisville 10, Kentucky

BRANCH OFFICES: NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO, ST. LOUIS, DALLAS, CHARLESTON, W. YA.

LOOKING FOR NEW ???

LOOKING FOR MORE???

LOOKING FOR BETTER ???

LOOKING FOR IMPROVEMENT ???

IT PAYS TO SEE VICTOR

STABILIZERS

TYPES — Stabilizers 53, 85, 21, and 6162X. Stabilizers 53 and 85 are organic phosphate salts, supplied in soft paste form. Stabilizers 21 and 6162X are liquids used in solvent films, as well as in organosols and plastisols.

USES: Light stabilizers for vinyl plastic films, and coatings. Used in organosol, latex, plastisol and solvent formulations.



Tanning is fine for sun-bathers. But for vinyl plastic, just the opposite is true. Exposure to sunlight caused some of these plastics to discolor. Since these products were ideally suited for upholstering furniture, automobile seats and for auto seat covers, vinyl makers searched for a solution to the problem. Victor light stabilizers (in paste, powder and liquid form) provided the answer. The problem of color deterioration due to light was eliminated. It pays to see Victor.

TETRAPOTASSIUM PYROPHOSPHATE

Tetrapotassium pyrophosphate is available as a white powdered or unmilled globular material.

USES: Builder and clarifier of liquid soaps. Dyeing compounds. Washing compounds. Boiler water treatment. Synthetic rubber.



The development of synthetic rubber on a large-scale basis helped win a war and built a new industry. Originally intended as a temporary substitute for pure rubber, synthetic rubber today proves far superior to the natural product for many purposes. Both Victor formic acid and Victor potassium phosphates are used as chemical intermediates in the manufacture of rubber. It pays to see Victor.

PHOSPHORUS OXYCHLORIDE

Phosphorus oxychloride is a water-white to slightly yellow liquid whose vapors are very irritating. It decomposes in water to yield phosphoric and hydrochloric acids, and is chemically very reactive.

USES: Intermediate in production of organic chemicals. Chlorinating agent. Catalyst.



A New Spark for Cars

Hailed as the greatest gasoline development in three decades, motorists are learning about a new phosphate additive for gasoline. This new discovery is claimed to give up to 15% more power, 150% more spark plug life, plus an increase in gasoline mileage. Victor phosphorus oxychloride is an intermediate used in this great development and plays an important role in the production of the final product. And so it goes. Throughout industry, phosphates take an increasingly versatile and important role. And when it comes to phosphates . . . it pays to see Victor.

DIAMMONIUM PHOSPHATE

Diammonium phosphate is a brilliant white, crystalline product, mildly alkaline in reaction. Meets all U. S. Pure Food Law requirements.

GRADES: Crystalline, powdered F. F., and dentifrice.

USES: Ammoniated dentifrices. To control the pH of soda crackers. (U. S. Pat. 2288118). Catalyst for urea and melamine resins. Chrome dyeing of wool. In the manufacture of calcium phosphates for use in phosphors. Flameproofing of paper, wood, textiles, and vegetable fibers. Prevents afterglow in matches. Plant nutrient solutions. Manufacture of yeast, vinegar, yeast foods, bread improvers, and alcohol. Acid cleaner for metal. Ingredient in glass and vitreous enamel.



Top Aide to Bread

To make bread you need yeast. And to grow yeast, Victor ammonium phosphate or Victor phosphoric acid are used. These Victor products encourage or feed the actual growth of the yeast culture. In the production of your daily bread, another Victor phosphate, monocalcium phosphate, acts as a bread improver and prevents "rope" . . . an objectionable bacteriological growth. Thus Victor products and services aid another important American industry. It pays to see Victor.

MONOCALCIUM PHOSPHATE, ANHYDROUS (Heat-treated)

TRADE MARK-V-90®

(U. S. Patents 2160700 and 2160232; Canadian Patents 388809 and 388810)

V-90 is a fine, white, free-flowing powder, each particle of which has a thin, continuous coating of a relatively insoluble phosphate which delays solution when aqueous liquids are added. This makes possible a delayed leavening action.

USES: Manufacture of self-rising flour, self-rising corn meal, pancake flour, prepared mixes, house-hold baking powder, phosphated plain flour, and bakers' angel food cakes. As an ingredient of baking preparations. (U. S. Patents 2160700-1 and 2160232-3)



Umm-m! Smell that corn bread! But even in the South, corn bread often had a tendency to be heavy and soggy when the sour milk and soda used for leavening did not properly balance each other in acidity and alkalinity. Today, however... thanks to new self-rising corn meal made with Victor's V-90... corn bread is unfailingly feather-light and tasty every time. Self-rising corn meal sales are booming as the direct result of Victor's anhydrous monocalcium phosphate (V-90). It pays to see Victor.

TRICALCIUM PHOSPHATE

Tricalcium phosphate is a white, crystalline, tasteless solid, which complies with all Federal and State Food Laws.

Tricalcium phosphate NF conforms to National Formulary IX, specifications effective November 1, 1950. Over 95% will pass through a 200 mesh screen. Conditioner for salt, soda, sugar and sulphur. Food enrichment.

3Ca,(PO,),

Tricalcium phosphate—Victor. A polishing agent for tooth paste and tooth powder. Accepted and listed by the Council on Dental Therapeutics of the American Dental Association

Tricalcium phosphate—granular. Sized so that substantially all passes through a 14 mesh and on a 50 mesh screen.

When it Rains, They Pour

One of life's petty annoyances is a shaker of salt that won't pour. To prevent caking of salt, soda and powdered sugar, most manufacturers now add small quantities of tricalcium phosphate. Calcium phosphate absorbs moisture and prevents caking. Victor tricalcium phosphate is an excellent conditioner and permits products to remain free-flowing without affecting normal flavor. If you have a caking problem . . . it pays to see Victor.



Concentrations: 75%, 80%, 85% N.F. 115% (Polyphosphoric)

USES: Manufacture of yeast, sugar, soft drinks, imitation jellies, gelatin, and pharmaceuticals. Rustproofing, engraving, railroad car cleaning, refining oil and gasoline, preserving silage. Weighting silk, and dyeing textiles. Chemical polishing and electro-polishing metals, bright-dip baths for aluminum. Manufacture of phosphates, dental cements, glue, ceramics, glass, metal treating compounds, explosives, and fertilizers.



What Makes "Pop" Popular

Cola drinks, soda or just plain "pop." Call them what you will but the great popularity of most carbonated beverages is due in part to the tart, tangy taste imparted by just a "touch" of food grade phosphoric acid. The remarkable purity of Victor phosphoric acid accounts for the fact that it acidulates millions of bottles of soft drinks. It pays to see Victor.

SODIUM ACID PYROPHOSPHATE

TRADE MARKS — Victor Cream, Perfection, B. P. Pyro

Victor sodium acid pyrophosphates are white powders whose purity meets the requirements of the Federal and State Pure Food Laws.

USES: Baking acid for doughnut flours, prepared flours. Manufacture of commercial baking powders, and baking creams. Conditioning oil well drilling muds. Acid type metal cleaner.



Better Donuts for Dunkers

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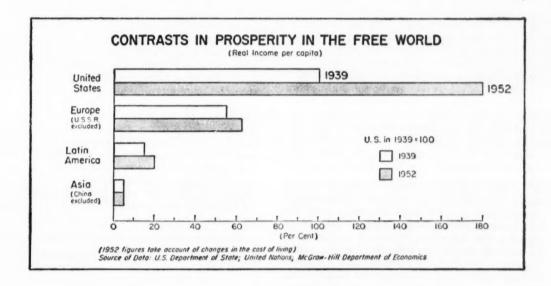
Contrasts in Prosperity Endanger the Free World

The chart in the middle of this page summarizes a situation of profound importance to every American. It shows that:

- On the average, Americans are vastly better off economically than most other people in the free world, and
- In recent years the gap in income between the average American and the average European, Latin American or Asian has greatly widened.

A Mounting Contrast

Even greater is the contrast between the real incomes of Asians and Americans. Today most Asians are no better off economically than they were back in 1939. On the other hand, the real income of the average American has almost doubled. As a result, the real income of the average Asian—always small by our standards—is now only a tiny fraction of that of Americans.



The chart shows that, at the outbreak of World War II, the real income (that is, actual purchasing power of income) of the average American was substantially higher than the average European's and much higher than the average Latin American's or Asian's. Since then, the European and Latin American have become better off. But the improvement in the economic lot of the average American has been so great that the others have been left far, far behind.

It must be remembered that the figures used to construct the chart are of varying quality. The fact is that few of the poorer countries have reliable statistics. However, it is generally agreed among competent observers, that the figures here presented offer a correct impression of the wide disparity in the average of real incomes between various parts of the free world. The figures, of course, have nothing decisive to say about spiritual and cultural values. In these, coun-

tries with relatively little material prosperity may be rich.

It is possible to draw a variety of morals from the story of lagging growth of income in other parts of the world. For one thing, it reflects the dynamic force of private enterprise. Private enterprise is characteristic of our economy far more than it is of most of the other free economies. The chart also reflects the fact that we are bountifully blessed with the natural resources essential to a high level of real income. Moreover, we did not suffer from the devastation and waste of two world wars as did many of the other free nations.

Narrowing the Gap

But perhaps the most important message which the chart conveys is one of warning. It warns that something must be done to narrow the gap in prosperity between America and other parts of the free world, if that world is to be united successfully in the struggle against totalitarian Communism. Writing in the HARVARD BUSINESS REVIEW, Kenneth E. Boulding recently put it this way:

"The crux of the problem is how to raise the three-quarters of the world that live on a low level to the high level of the other quarter, for it is precisely this wide disparity that makes our world so unstable. American-Russian relations, for instance [are]... complicated almost unbearably by the fact that each power is competing for the support of the vast fringe of underdeveloped countries... These countries are dissatisfied with their present state and are hovering between the two cultures, wondering which offers them the best chance of shifting from their present low-level to a high-level economy."

Very real danger threatens from any feeling which may develop in the less fortunate free nations that our enviable economic progress has been made at their expense. Instead of viewing the American economic system as a model that might be followed by their own countries, they may be led to see in it a menace to their well-being. If Communist propaganda can persuade these people that their alliance with the free world will only result in their dropping farther and farther behind an increasingly prosperous United States, they will be driven to the side of totalitarianism.

Test of Effective Leadership

How can these free nations on the lower half of the income ladder be helped to alleviate the conditions that keep them there? Surely this question poses a whole series of complicated problems. Yet, if we do not exercise some effective leadership toward their solution, we can be sure that Russia will take advantage of the situation. In these circumstances, it is essential to both the stability and security of the free world that we help our less prosperous neighbors make satisfactory headway.

This does not mean that the United States should sacrifice its own economic progress in favor of some sort of global leveling scheme. On the contrary, a continually expanding and stronger economy is essential if we are to provide any real aid to our friends. Also, it goes without saying that our friends must be disposed to do all they can to improve their own economic position, if our cooperation to that end is to be effective.

Great Skill Required

Our part in a program to achieve this goal calls for a high degree of skill and statecraft. It involves international trade policy, which, in itself, presents a perplexing range of problems. It involves also programs of foreign technical and economic assistance. And expanded foreign investment must play a key role in a balanced program to strengthen the economies of the free world for our common good.

The Commission on Foreign Economic Policy, headed by Clarence Randall, has recently submitted a report, embodying the results of a monumental inquiry into our foreign economic relations and measures to improve them. From the very nature of the subject, discussion of the report is bound to be attended by much controversy and conflict. However, an awareness of the facts presented by this chart should inspire us to accord to the problems posed by the Randall Commission the careful and sober consideration they must have if any real progress is to be made in raising the general standards of human well-being throughout the free world. Our willingness and ability to do this have now become the real test of our statesmanship, both at home and abroad.

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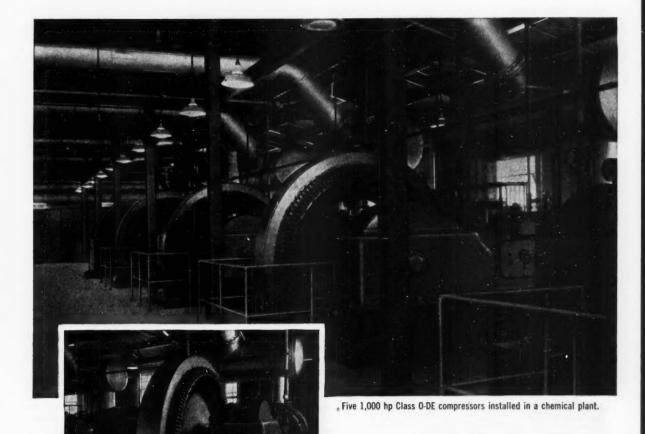
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CHEMICAL ENGINEERING-March 1954

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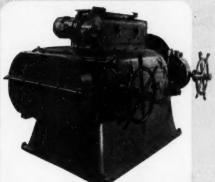
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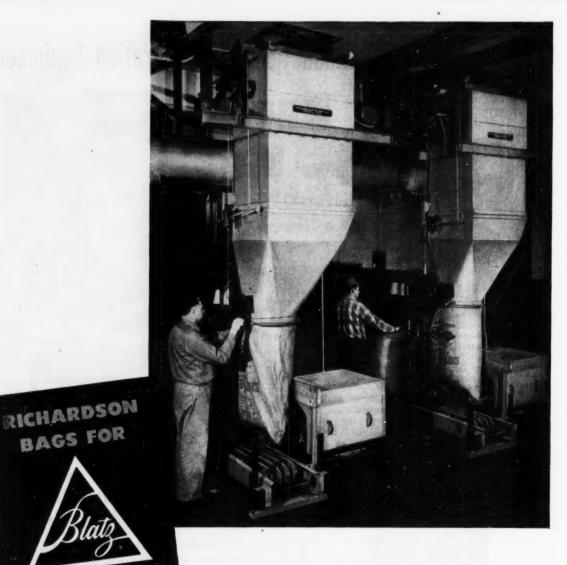
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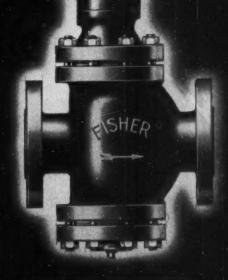
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LAG ERROR IN POSITION AT 9 LBS. CONTROLLER-PRESSURE		TRAVEL TRAVEL	0 0006 AVE				
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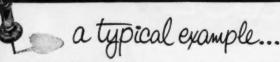
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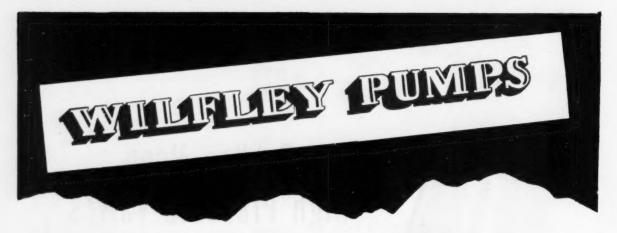
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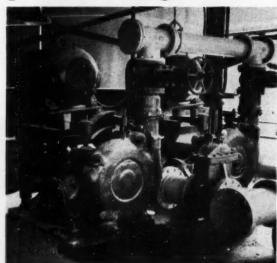
from Primary Slurry to Tailings

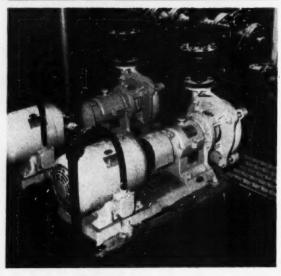
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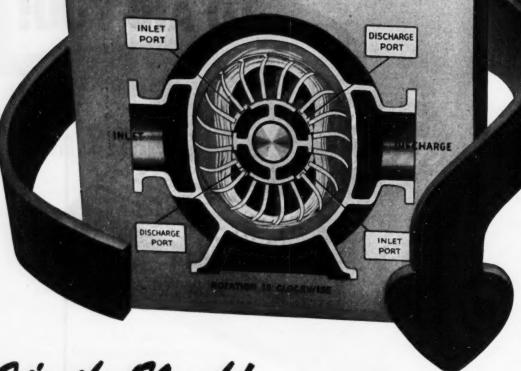
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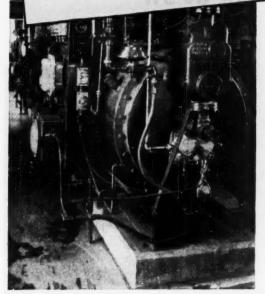
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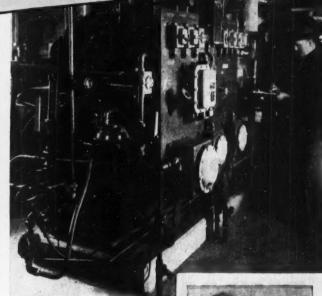
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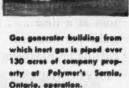
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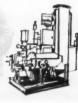
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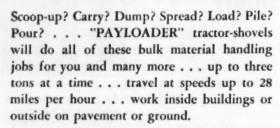




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• That's what our field engineers are often able to say after studying your process requirement. You'll find they are backed by the experience which we and thousands of friends in chemical plants have gained in years of working together. Since the early twenties, L&N has been introducing new instruments to chemical plants.

Of course, successful instrumentation demands fine equipment as well as "know-how". It requires a winning combination of proven performance, qualified engineering and skilled craftsmanship to give you . . . advanced electronic-designed Speedomax® recorders, indicators and scanners . . . time-tried analyzer cell systems . . . electric and pneumatic 3-function controllers.

This check-list shows you our wide-range, application instrumentation:

Temperature—for all industrial applications featuring entire temperature spectrum by thermocouple, Thermohm® or Rayotube®.

Thermal Conductivity—for binary or simple gas mixtures.

Infrared Analysis—for multi-component gas mixtures.

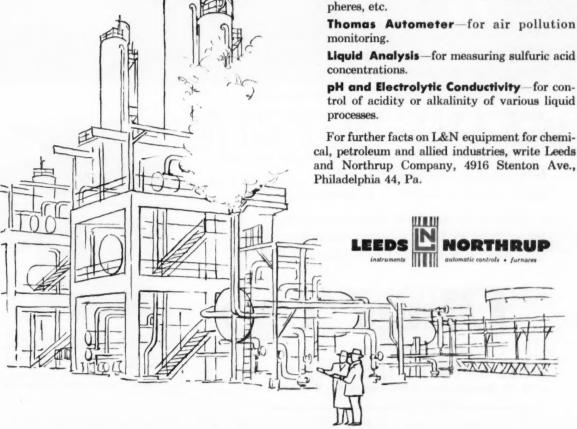
Magnetic Oxygen Analysis—for O2 control in processes of combustion, protective atmos-

Thomas Autometer—for air pollution

Liquid Analysis—for measuring sulfuric acid concentrations.

trol of acidity or alkalinity of various liquid

For further facts on L&N equipment for chemical, petroleum and allied industries, write Leeds and Northrup Company, 4916 Stenton Ave., Philadelphia 44, Pa.





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acids and bases?

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It's pure cast alumina . . . very hard, very inert, very nearly impermeable.

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It takes a temperature of 3600 F to melt this refractory. The castings are so hard (hard enough to cut glass like a diamond) that they outwear metals. And so pure that the traces of impurities total less than 0.07%—a consideration if contamination is a factor.

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- As a starter, send literature only.
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...your BEST enclosed and explosion-proof motor BUY

7 Fan — efficient, non-sparking fan. New aerodynamic design for more effective cooling.

2 Inner bearing cartridges
— lock bearings to end
bracket and form explosionquenching seal along shaft.

3 Indestructable cast-aluminum rotor—dynamically balanced with fan for smooth, quiet operation,

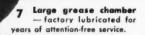
Stater — prewound stater core utilizes Formvar wire insulated with a new Alkyd Asphalt Resin insulating varnish.

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— a motor with
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that add to the appearance of your
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explosion-proof motor. Every feature in this new line is designed for easier installation, longer service life, less maintenance and attention. You get the full benefit of the new NEMA standards in a smaller, more functional, completely modern design.

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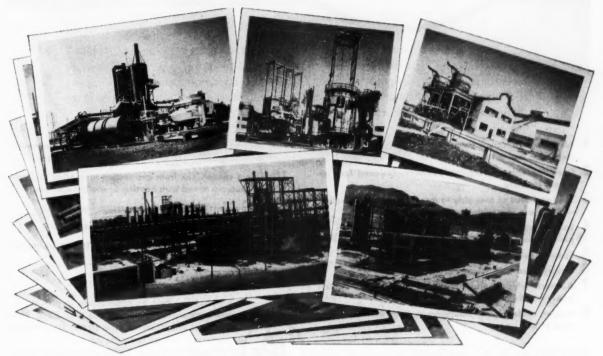
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Year of Service to the Chemical Industry Generally, there's not much point in telling people how long you've been in business. But it so happens that the 40 years of Chemico's existence also marks the period of greatest growth of this country's huge chemical industry. Chemico is proud of its part in the development of this industry . . . a development that required more than a little pioneering courage.

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- All heat-transmitting surfaces are readily accessible for inspection and cleaning.
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- 5 Space requirements are small.
- 6 Unsurpassed heat transmission.
- 7 All parts which contact the liquid are made of highest quality acid-resisting stainless steel.
- 8 Heater, cooler and regenerative sections may be assembled in one unit.

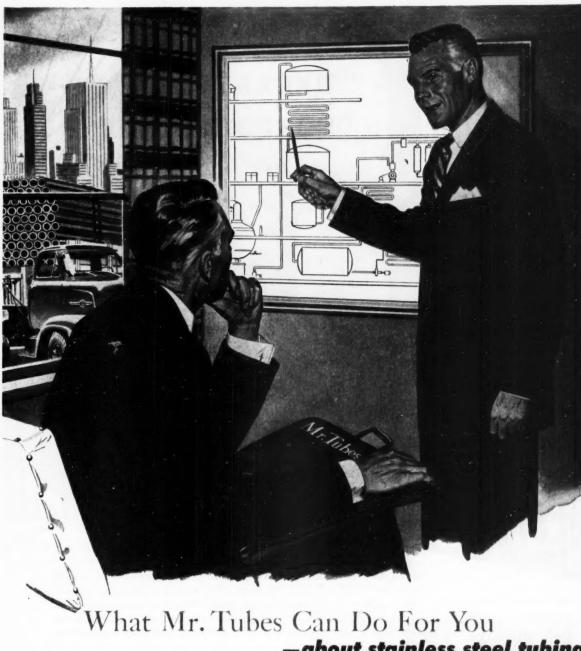
- 9 Several liquids can be heated or cooled simultaneously in different sections of the same Heat Exchanger.
- 10 Liquid cannot leak from one section to another and cannot become mixed with heating or cooling medium.
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- 12 Gaskets readily replaceable in user's plant.
- 13 Highest quality instrumentation by Taylor Instrument Company.
- 14 Wide range of sizes and capacities.

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-about stainless steel tubing

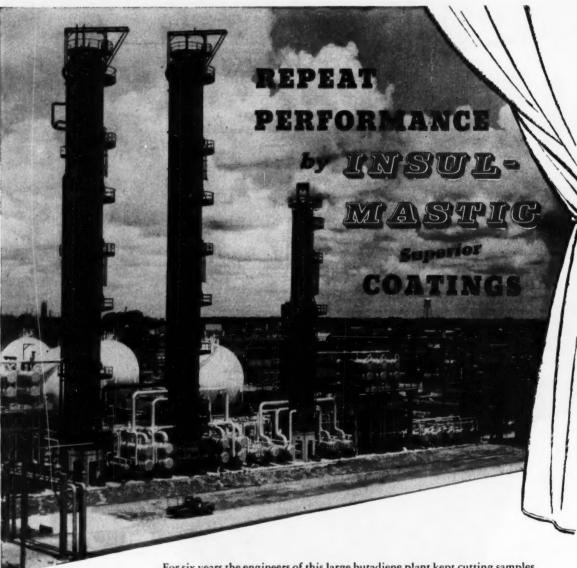
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For six years the engineers of this large butadiene plant kept cutting samples out of their INSUL-MASTIC coatings. They wanted to determine the condition of the metal or insulation underneath. What they found was so satisfactory that INSUL-MASTIC was specified when the three new towers above were built. It takes excellent results to command a repeat performance from such critics.

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• When you ship in U. S. Steel Drums you can be sure your products will arrive at your customer's plant in the same excellent condition as when you shipped them . . . same color, same purity. Here's why:

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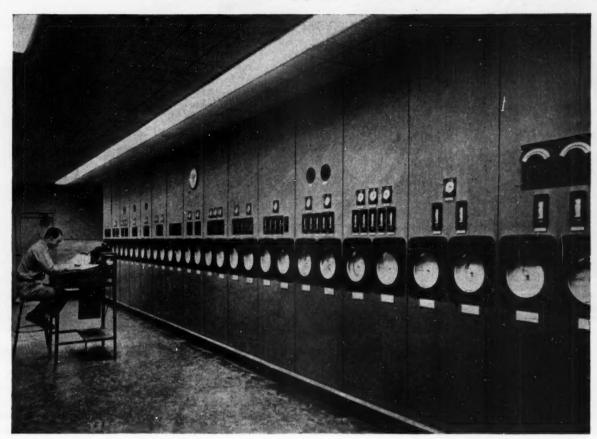
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Acetone Content, % min						9			99.5
Specific Gravity @ 20/20°C									0.79100.7925
Distillation Range, °C, max. inc	cl. 5	6.1°	C						1
Color, APHA†, max									5
Acidity, % by weight as Acetic	c, m	ax.							0.002
Acidity, after CO2 removal, pps	n. m	ax.							1.0
Alkalinity as NH ₂ , ppm. max.			*						1.0
Permanganate Time, min									2 hrs.
Water		٠	٠	٠	٠	٠	٠	٠	Miscible without tur- bidity with 19 Vol. of 10° heptane @ 20°C.
Corrosion Test									Pass
Mercury Test									Pass
Silver Nitrate Test									Pass
Non-volatiles, gms/100 cc. san	nple	max	κ.						0.001
Solubility, in distilled water									Completely miscible

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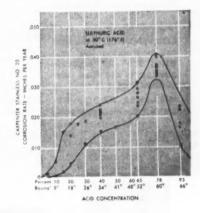


Today many plants are enjoying new freedom from corrosion, longer equipment life and fewer shutdowns . . . because of Carpenter Stainless No. 20. Take the job shown above. In this application, ½" rd. rods of Carpenter No. 20 and Stainless Type 316 were installed to handle H₂SO₄ at the rate of about 50 gallons a minute in a full range of solution varying from 0% up to 58% concentration. Temperature: 70° C. (158°F.). After four days the Type 316 rods failed and were replaced with 1" sq. No. 20 rods. After being in service 3,747 hours of a possible 6,144 hours over a period of 256 days, the No. 20 rods showed no apparent corrosion whatsoever. (See unretouched photo above.) Of

course, Type 316'is satisfactory for certain dilute solutions of H₂SO₄ and many other corrosive conditions. But with a tough problem like the one described here, it takes No. 20 to do the job.

Note the band of corrosion resistance in the chart to the right. Consider it from the standpoint of how Stainless No. 20 can help you curve your own headaches in handling sulphuric acid. Of course, we'll be glad to work with you in any way we can. As a start, drop us a line on your company letterhead for Carpenter's booklet of more detailed information on No. 20. Test coupons are also available at your request. Investigate now how you can solve, once

and for all, your costly corrosion problems. THE CARPENTER'S STEEL COMPANY, 127 W. Bern St., Reading, Pa.





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Stainless No. 20

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Every Angle" DIAL THERMOMETER





The American "Every Angle" Dial Thermometer is easy to install and turn to any position for accurate face-to-face readings. Specify the "Every Angle" — indoor or outdoor design — and this unbeatable feature combination is yours:

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The "Every Angle" Thermometer is made of precision-machined, non-corrosive materials and operates by vapor pressure. It is precisely calibrated against certified standards to assure the most critical reading in the upper third of the dial, where the graduations are farthest apart.

CONVENIENCE. Dial face can be rotated 180° and tilted 180° for accurate reading at the most convenient angle.

WEATHER-PROOF DE-

SIGN. Screw-type ring

with tight-fitting gasket for weather-proof outdoor service; slip ring design for indoors.

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Heavy-gauge swivel hinge has a stainless steel kingpin. Reinforced connection between hinge and bulb. Greater strength and corrosion resistance, long service life!

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NON-CORROSIVE DIAL CASE: Noncorrosive aluminum with smooth black finish. No protruding screw heads. Nickelplated brass cup houses coiled capillary tubing.

DIAL: 3½" diameter. White with black figures. POINTER: Black, adjustable. FRONT: Heavy plate glass. MOVEMENT: Bronze or stainless steel. BULB AND STEM: Stainless steel. SIZE CONNECTION: ½", N.P.T. STEMLENGTHS: 3", 5-5/16", 12", 18" and 24". SEPARABLE SOCKETS: Bronze, carbon steel or stainless steel.

STANDARD RANGES

	Fahrenheit	
-60 to 20°		30 to 300°
-20 to 120°		100 to 300°
40 to 140°		90 to 350°
30 to 180°		190 to 390°
20 to 220°		260 to 450°
0 to 100°	Centigrade	40 to 150°



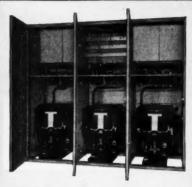
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Rear view of HALC Controller Line-up. Bus covers provide maximum protection for personnel and equipment. Starters may be equipped with either oil-immersed or airbreak contactors... installed in the same space. All components are readily accessible for maintenance.

Type H Starters

Easy to Install Simple to Expand Attractive in Appearance

The factory assembled line-up of Type H Starters affords the many advantages of centralized high voltage control for an entire department or plant. One attractive, space-saving group takes the place of many separate cabinets and components. Planning and purchasing are simplified. Installation is quick and easy — only one incoming power feeder required. Internal bus and convenient wiring pro-

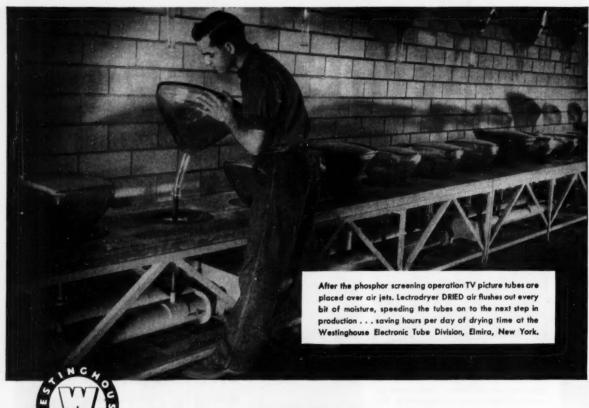
visions plus standardization of cubicle size facilitate the addition of starters.

Allis-Chalmers Type H Starters may also be used singly. Each starter is a complete control unit. Contactors, protective devices, meters, relays...all the coordinated components necessary for maximum protection of man, motor and machine are engineered into each starter.



New Bulletin — Type H Starters are built in a wide range of ratings for squirrel-cage, wound-rotor and synchronous motors ... for full or reduced voltage ... reversing or non-reversing ... with plugging, dynamic braking and multi-speed features. New bulletin 14B6410B tells the complete story. See your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS



you can see the moisture disappear!

After applying the phosphor coating to picture tubes they must be dried. Ordinarily, this is a slow process. To speed this action, Westinghouse flushes the tubes with warm, DRY air. Production lines flow faster, and more uniform drying of the phosphor particles is assured.

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Dewpoints lower than -110° F can be reached.

Such DRYness speeds up production, reduces spoilage, protects materials and keeps chemicals reacting properly for many manufacturers. Lectrodryer may be your answer to troublesome moisture problems.

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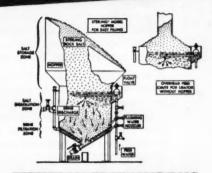
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LIXATE BRINE vs. ORDINARY BRINE

	LIXATE BRINE	ORDINARY BRINE	
Salt Storage	Above or near the Lixator hopper	In separate piles or bins	
Brine Storage	None. Made as needed In separate vats		
Handling Costs	Zero	Cost of labor	
Measurement	100% accurate	Guesswork	
Saturation	100%	Haphazard	
Preparation	Automatic	Cost of labor	
Distribution	Piped	Cost of labor	

the LIXATE* process for making brine



HOW LIXATOR WORKS

In the dissolution zone—flowing through a bed of Sterling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. In the filtration zone—through use of the self-filtration principle originated by International Salt Company, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

INTERNATIONAL SALT CO., INC. SCRANTON, PENNSYLVANIA

SALES OFFICES: Atlanta, Ga. • Chicago, Ill.
New Orleans, La. • Boston, Mass. • St. Louis, Mo.
Newark, N. J. • Buffalo, N. Y. • New York, N. Y.
Cincinnati, O. • Philadelphia, Pa. • Pittsburgh, Pa.
Richmond, Va. • ENGINEERING OFFICES: Atlanta, Ga.
Chicago, Ill. • Buffalo, N. Y. • Reg. U. S. Pat. Off.

Making brine need no longer be complicated, inaccurate, costly. Now, thanks to the LIXATE Process, developed by the International Salt Company, you can have brine automatically—where you want it—when you want it—at the turn of a valve.

Because this pure brine is always 100% saturated brine—because it always contains exactly 2.65 pounds of salt per gallon—your brine measurements are always exact—100% accurate.

Hundreds of companies have already saved thousands of dollars, have improved the quality of their products by installing the International Salt Company's *Lixate* Process. Let International's Industrial Division help *you*. Send the coupon below, today.

INTERNATIONAL SALT COMPANY, INC. INDUSTRIAL DIVISION, Scranton 2, Pa.

I am interested in knowing what the Lixate Process can do for MY plant. Please have an International Industrial Engineer contact me as soon as possible. I understand there is no cost, no obligation.

ADDRESS

CITY ZONE

STATE

91916

DARCO

DARCO DEPARTMENT - ATLAS POWDER COMPANY
Darce General Sales Offices—60 EAST 42nd STREET, NEW YORK 17, N. Y.
ATLAS POWDER COMPANY, CANADA, LTD., BRANTFORD, CANADA

How DARCO Eliminates Turbidity and Haze

DARCO treatment is low-cost sales insurance that protects against changes in product appearance

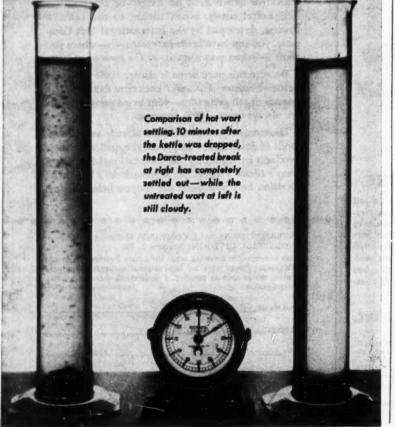
The desirable clear appearance of many liquid products, particularly beverages, often can be marred by haze or turbidity which forms during storage. This condition detracts from sales appeal—and it can frequently be cured by treatment with Darco activated carbon.

In most instances, haze is something that is not visible when the product is packaged, but appears later. It is generally caused by the precipitation of an ingredient under storage conditions which favor precipitation...such as heating, cooling or carbonation.

Since the guilty ingredient must have been at the point of falling out of solution before the haze formed, the obvious answer to the problem is to remove the material before packaging. Fortunately, many haze-forming constituents are readily adsorbed. Treatment with Darco proves an effective and economical way to remove them.

Typical examples of this application for Darco are the prevention of chill haze in beer due to nearly insoluble proteins, and curing turbidity in carbonated beverages.

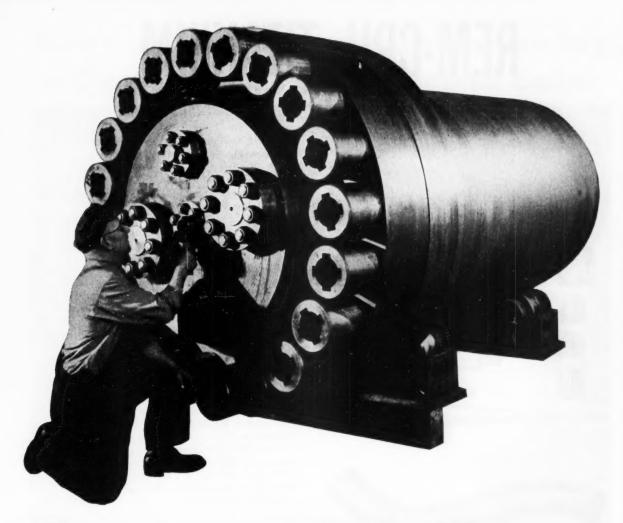
It is relatively simple to determine whether turbidity can be prevented by Darco treatment, by means of accelerated storage tests on samples. Darco specialists will be glad to assist you with technical recommendations.



Undesirable odors adsorbed by DARCO

Off-flavors and unwanted odors are due to volatile substances. They waft unpleasant messages to the customer's nose the instant he opens the package.

Cleaning out stray smells is a Darco specialty. For example, the production methods used for making a certain polybasic acid gave it a characteristic unpleasant odor. In the end product, a polyester resin, this odor would detract from consumer acceptance. By treating with Darco G-60, the offending impurity was eliminated, and an odor-free acid was produced.



Where some of the huskiest vessels on earth have been built

This short, squat, and exceedingly sturdy reactor is another of the many Bethlehem vessels made for high-pressure work. The job was forged, machined, assembled, and tested in Bethlehem's shops, where some of the huskiest vessels on earth have been built.

Almost any day, any week, any year, you are likely to see forged vessels at some stage of manufacture in our plant. They may be autoclaves, filters, converters, high-pressure accumulators, reactors, or separators—any or all of these types.

For Bethlehem has long specialized in this work and handles every step of production, from making and forging the steel to the final step of assembly.

Of course Bethlehem vessels are of seamless design for added strength and safety. Though most of them are single-section units, they can be furnished as flanged multiple-section types when desired.

When you require forged vessels for high-pressure work in the chemical, rubber, petroleum, fertilizer, food-processing or allied industries, we suggest you call us. Our staff of engineers will be glad to co-operate in every way possible.

BETHLEHEM STEEL COMPANY BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



REM-CRU TITANIUM

facts about a new metal for the chemical industry



Tubing and fittings such as these, made from Rem-Cru titanium, help eliminate down-time in the chemical industry

REM-CRU titanium's remarkable resistance to corrosion plus its structural qualities make it a very attractive engineering material for use in processing certain chemicals. And the fact that it retains useful strength up to 800-1000F is an important consideration in your design of processing equipment. To acquaint you more fully with titanium's potentialities, here are some additional facts about this new structural metal.

Corrosion Properties—Titanium is not corroded by most nitric acid solutions, wet chlorine and chlorine water, mixed sulphuric and nitric acids, ferric chloride, cupric chloride, and almost all salts. But it is not recommended for service in mineral acids unless oxidizing agents are present, nor in formic acid or dry chlorine.

Titanium is completely impervious to salt water corrosion. It has been exposed in the ocean at the International Nickel Company's test site at Kure Beach for five years with no indication of corrosion or attack.

In another test conducted by the U. S. Naval Engineering Experiment Station two REM-CRU titanium alloy specimens were rotated in natural sea water for 60 days. Average water temperature was 33F—specimen velocity, 27 ft. per sec. Again, the titanium specimens suffered no visible corrosion or erosion during the test.

New Applications—Experimental testing under individual plant conditions has been disclosing new applications where the use of titanium can eliminate costly replacements. Applications that appear to be very promising in the chemical field are condensers, evaporators, autoclaves, containers, tubing, valves and fittings.

Availability—REM-CRU is one of the principal producers of titanium. Today we are shipping titanium bars, plates, sheets, strip, wire, tubing, forging and billets on a tonnage basis. Limited quantities are available for other than priority military applications. And the supply of REM-CRU titanium will be increased several fold within a year as facilities are expanded.

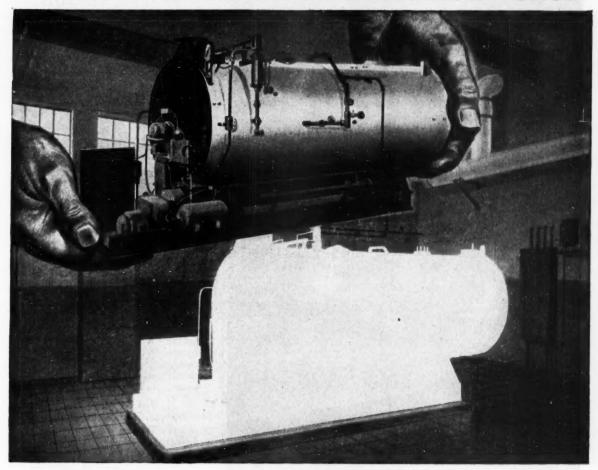
To keep abreast of the latest developments on this vital metal, write for the Rem-Cru Review—
a free periodical devoted to the application and fabrication of titanium and its alloys.

REM-CRU TITANIUM

TANIUM REM-CRU TITANIUM, INC., MIDLAND, PENNSYLVANIA

March 1954—CHEMICAL ENGINEERING

Here's why you get more...when you buy a Cleaver-Brooks Self-Contained Boiler



...only Cleaver-Brooks can offer you the experience gained from more than 20 years of pioneering . . . and more than 12,000 individual "packaged" boiler installations

CLEAVER-BROOKS pioneering has been largely responsible for simplifying boiler buying . . . lowering costs of installation . . . delivering 80% guaranteed steam efficiency from every fuel dollar when firing with oil.

Boilers can be shipped as completely assembled and tested self-contained units, with auxiliaries as required. Installation involves minimum of time, construction and space. Usually connections only to steam, fuel, water lines and electrical service are needed. No special foundations are required. A short vent takes care of exhaust gases. Frequently, boilers are ready for use in a matter of hours, depending

on availability of service lines.

Cleaver-Brooks, originators of the self-contained boiler, offers wider experience that counts in another important way. Qualified engineers help you plan steam plants tailored exactly for your needs. Carefully analyzed are loads, space and equipment arrangement. This not only helps you solve present steam needs, but adds flexibility for future expansion as well.

This application engineering, plus basically sound design and construction is your assurance of a full return from your boiler investment. When you specify a self-contained boiler — make sure it's a Cleaver-Brooks.

Send for Catalog AD-100 for full details on Cleaver-Brooks boilers. Available for oil, gas and combination oil/gas firing. Sizes 15 to 500 hp, 15 to 250 psi — for heating and processing.



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Dept. C-364 E. Keefe Ave.

Milwaukee 12, Wisconsin, U.S.A.

Cleaver-Brooks

ORIGINATORS OF THE SELF-CONTAINED BOILER

Steam Boilers * Oil and Bitumin Tank Car Heaters * Distillation Equipment Oil and Gas Fired Conversion Burners

SMOKE BLOWN THROUGH a Norton ALUNDUM* seamless tube escapes throughout the tube's entire area. Such a tube gives most efficient filtration and ease of cleaning by back washing. When selecting tubes for your specific application be sure they embody this important feature.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

POROUS MEDIUMS

Making better products to make other products better NORTON COMPANY, WORCESTER 6, MASSACHUSETTS

Why Norton <u>seamless</u> tubes give you better filtration

Only Norton ALUNDUM tubes have the seamless construction that means more uniform filtration and enables faster, more thorough cleaning. And like all Norton porous mediums they're made with the patented controlled structure process that assures even distribution of pores — in the size and open-pore ratio that best meets your needs.

Cost-cutters over a wide job range

In any form, Norton porous mediums have exceptional resistance to breakage, chipping and acid and alkaline conditions. They're designed to perform better, last longer and cut your operating costs in a wide variety of chemical field applications. For example: filtering water or solvents... cutting oils, wine and other liquids...reclaiming cleaning fluids and industrial waste... in boiler feed water treatment.

Get the whole story

See your Norton Representative for complete facts on how you can get more savings and satisfaction with Norton porous mediums. Or write describing your requirements, to Norton Company, 502 New Bond St., Worcester 6, Mass. Canadian Representative: A. P. Green Fire Brick Co., Ltd., Toronto, Ontario.

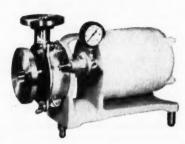


NORTON ALUNDUM POROUS MEDIUMS are available as tubes, plates and discs in a wide range of sizes.

Add longer life and greater economy

to your processing lines

with TRI-CLOVER WELDING FITTINGS



For top quality Centrifugal Pumps... be sure to investigate the many advantages offered through the use of Tri-Clover corrosion-resistant industrial pumps for an extremely wide range of applications. For complete details, write for new Catalog 253. • Tri-Clover Butt Welding Fittings in Stainless Steel
Type 304, 347, 316 and other analyses, are custom fabricated
from highest quality materials by skilled craftsmen backed
by years of specialized experience. Because of this
quality, plus full corrosion resistance and longer life, the end
result is greater economy in process line service.

result is greater economy in process line service.

Tri-Clover Zephyrweld® lightweight welding fittings are made in tube O.D. sizes from ½" through 24" and 36".

Those through 4" are annealed, pickled and passivated.

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Available in all standard fitting types.

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For stainless steel welding fittings for every process need, be sure to specify TRI-CLOVER.

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TRIALLOY AND STAINLESS STEEL SANITARY FITTINGS, VALVES, PUMPS, TURING, SPECIALTIES FASSICATED STAINLESS STE

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Super 66 " Super 66 " Inculation Co



Conforms to Commercial Standard CS-117

Insulating Cement



Because Eagle-Picher Super "66" Insulating Cement *really sticks*, it has money-saving advantages that are apparent the minute your crew begins to apply it.

Because it sticks—less time is wasted in application—it stays where you put it whether the equipment is heated or temporarily out of service. It "holds together" — usually no reinforcing needed on applications up to $1\frac{1}{2}$ inches thick.

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And—Super "66" is rust-inhibitive—cannot cause corrosion—actually helps prevent corrosion of costly equipment.

If you've never tried Eagle-Picher Super "66," it will pay you to learn more about it today!

"Springy Ball" structure—the secret of the high thermal efficiency of Super "66." These small, resilient pellets of mineral wool, each one honeycombed with thousands of minute air cells, effectively resist the flow of heat even when used on equipment heated to 1800 F.

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FIND OUT—How Many Ways This Cooler Can Cut Costs for You!

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You save up to 30% on installation costs over comparable coolers. Pre-tested and pre-assembled, your cooler is shipped to your site in two sections where it is easily installed without costly revamping of plant. Less headroom is required — there are fewer costly auxiliaries.

SAVE ON FUEL Movable baffle in air housing above clinker bed isolates and directs hottest air to kiln. Combustion efficiency is greatly increased.

Uniform bed of material passing over grating requires only low pressure air. Comparatively smaller fan and motor uses only about ½ hp-hr per barrel of clinker. Fewer auxiliaries to drive.

SAVE ON MAINTENANCE Simplified design and small number of parts require little attention. Low upkeep cost. Lubrication is required only on drive mechanism. Only four grease fittings. Horizontal grate system insures smooth flowing bed of material and high efficiency cooling throughout. There is little or no wear on grates or grate warpage. Maintenance is only about 1/10 cent per barrel of clinker.

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Centains valuable engineering in formation on cooling that can help make your operations more profit ablel it's a book you'll want to

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Please send my copy of Air-Quenching Cooler Bulletin 07B7869.

Name

Company

Position

1

ALLIS-CHALMERS



Plaskon 3120 has been recognized since
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for refrigerators, ranges, and other home
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qualities of durability, gloss and
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since 1947

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Good color retention, adhesion, and film toughness are of primary importance in baked coatings, interior and exterior enamels, automotive undercoats, general industrial air-drying primers, and coatings for metal furniture and equipment. Glycerine alkyds are favored as vehicles for coatings of this type.

Not only does Glycerine impart the desired properties to the resin.

It also simplifies the resin-making process because it is so easy to handle.

Its cooking qualities are excellent. It is easily controlled to give product of low acid number without undue hazard of gelation.

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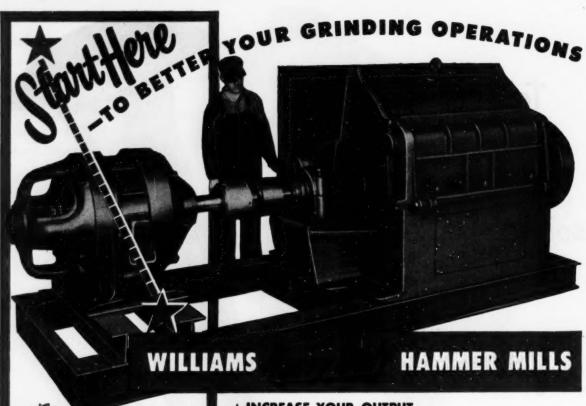
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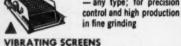




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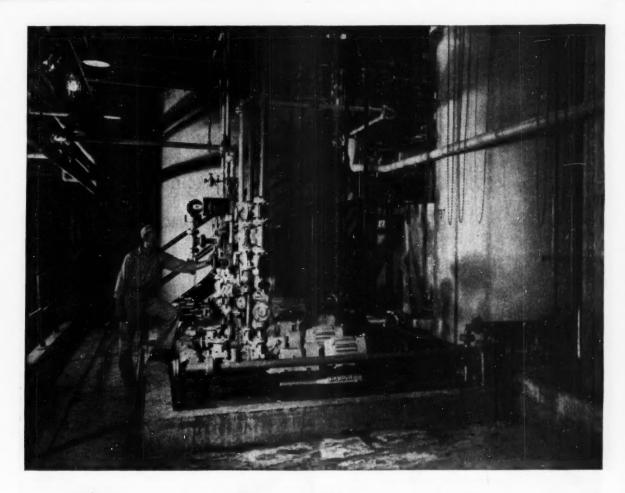
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Here's a battery of LaBour DZT and DPL pumps at the Michigan City, Ind. plant of American Cyanamid Company. This group included pumps for handling aluminum sulphate, sulphuric acid, and caustic soda, with valving to permit great flexibility of service.

This compact, well-organized installation is typical of the competent engineering so frequently associated with the use of LaBour pumps. Actually, of course, it's the other way round—LaBour

pumps are usually chosen by the competent engineers who take pride in creating installations to operate profitably.

Men who are unwilling to compromise with the future—who stake their professional reputations on year-after-year performance of their handiwork—generally insist on LaBour pumps for the installations they design. The resulting cost figures, compiled for overall service, prove their wisdom.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

THE LABOUR COMPANY, INC. * Elkhart, Indiana, U.S.A.





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catalysts

to your specifications

Harshaw manufactures to specification dozens of catalysts for many different and complex manufacturing processes. The experience of more than fifteen years in helping to solve a great number of individual catalyst problems places us in a most helpful position, either in the development of the best and most economical catalyst, or in qualifying with large production capacity requirements. If you have a problem, perhaps a discussion with us will prove helpful.

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Hydroforming Dehydration
Dehydrogenation Isomerization
Alkylation Oxidation
Cyclization Desulphurization
Hydrogenation

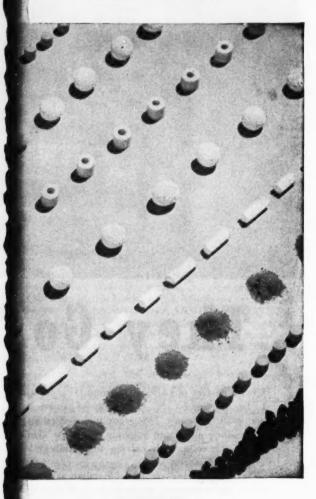
TYPICAL CATALYSTS

Aluminum Chloride Anhydrous Boron Fluoride Addition Compounds Boron Trifluoride

Hydrofluoric Acid Anhydrous

Alumina Chrome Alumina
Molybdena Alumina
Cobalt Copper
Mercury Magnesia
Vanadium Nickel

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New Way to insulate storage tankspermanent, more efficient, more economical

If you could insulate 400 square feet or more of a storage tank in one easy operation, how much could you save over the block-at-a-time method? You'd save plenty — as others are doing with ULTRALITE long glass fiber insulation.

The method is simple: Take a blanket roll of Ultralite and cut off strips the same length as the height of the tank. Start at the top of the tank and let a strip of lightweight Ultralite float toward the ground, impaling it on welded studs as it goes. No wiring, no banding. Just that quick, one part of the tank is insulated from top to bottom, and the insulation crew moves on, keeping well ahead of the men who apply the sheet metal jacket.

No expansion joints necessary . . . no damage from water . . . no heat loss from "fluing action" . . . no problems when tank repairs are necessary — for ULTRALITE is resilient, reusable, won't absorb moisture!

Write today for "how-to-de-it" specifications and name of your local Ultralite distributor



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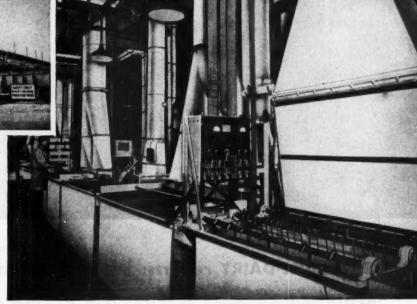
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General exhaust of an entire building where fumes are generated.



Exhaust system consisting of hoods, piping and fans, for collection of fumes and vapor at point of generation.

Improves Working Conditions Eliminates Fire Hazards Lowers Maintenance Costs

Proper fume control can eliminate fire or explosion hazards, improve employee health and morale through better working conditions, and lower maintenance costs. To help solve *your* fume control problem, Sturtevant has a wide background knowledge based on a variety of applications in many industries.

The systems pictured are equipped with Sturtevant fans (1) to collect and exhaust explosive fumes that result from processing operations dispersed throughout a general area, or (2) to carry off injurious vapors where

individual operations generate corrosive or injurious smoke and fumes within a confined area. Whatever the application, Sturtevant can provide fans, exhausters and air handling apparatus to handle fume problems in your plant.

To obtain complete information on your problem, contact your local Sturtevant office, or write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

YOU CAN BE SURE ... IF IT'S

Westinghouse

PUTTING AUX TO WORK

J-8020







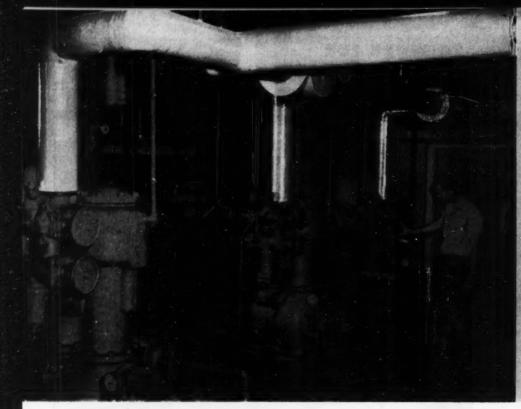




AIR HANDLING UNITS

INDUSTRIAL FANS

AXIAL FLOW FANS





Here FOAMGLAS is shown being applied to the piping.



Utility tunnelway in which hundreds of feet of refrigerated tubing are insulated with FOAMGLAS.

LAKE TO LAKE DAIRY reports: We can salvage FOAMGLAS insulation because it stays dry during piping changes



Wesley Wise Production Manager Lake to Lake Dairy

Wesley Wise, plant production manager of the Lake to Lake Dairy Cooperative, at Kiel, Wisconsin reports: "Because of the continual shifting of equipment due to changing markets in the dairy business, we have the problem of breaking into insulation to make new connections. FOAMGLAS pipe insulation . . . a strong, rigid structure of sealed glass cells can not become watersoaked during such changes.

"On a complete remodeling job, the cloth which covers the piping can be cut along the joints and the FOAMGLAS salvaged for use at another location, re-covered with new cloth, and the insulation made as good as new in effectiveness and appearance. FOAMGLAS' rigidity enables our maintenance crew to apply it and easily obtain a professional looking finish."

Like the Lake to Lake Dairy Co-operative, you can benefit from the many advantages FOAMGLAS has to offer. Unlike ordinary pipe insulations, FOAMGLAS stays dry, assuring constant life-long insulating performance and avoiding corrosion of piping.

For more information, you should send for our new booklet detailing the use of FOAMGLAS for piping and equipment. Write, to Department H-34.

PITTSBURGH CORNING CORPORATION . One Gateway Center . Pittsburgh 22, Pa.

FOAMGLAS®

the cellular, stay-dry insulation







Pittsburgh Corning also makes PC Glass Blocks

SPARK OF GENIUS

Once a generation an idea will spark a new way of life. And just such an idea was the self-starter, sparking a new social and industrial revolution. And the man who started it all . . . the man who did more to bring the back seat driver up front, and open new vistas for American ingenuity, was none other than Detroit's Charles W. Kettering.

Yes, in 1911, "Boss Ket" disclaimed the experts by building an automobile self-starter small enough to be practical, and practical enough to be standard equipment on all 1912 Cadillacs.

The story of electricity and wheels is one that has done more than any other invention to change the face of America. Yet, for all its obvious superiority, the automobile did not compete successfully with the horse until the genius of Kettering put the crank in the back seat and the high heeled slipper on the accelerator.

However, this tremendous contribution would not have been possible without platinum. And Bishop, America's first platinum refinery, is proud of the part it has played in the growth of the automotive industry and the nation.

Yes, platinum has fulfilled an important part in the phenomenal growth of the automobile industry, as well as myriad other great industrial achievements. And since 1842, almost 80 years before anyone else even thought of refining and fabricating platinum, Bishop has been busily contributing precious metal research and "know-how" to science and industry.

So why not borrow from this wealth of 111 years' experience? Specify Bishop on your next precious metals requirement.





Quality Leadership is Tested by Time—No. 2 of a Series

J. BISHOP & CO. . Platinum Works

Precious Metals Division . Malvern, Penna.

danger...sr

How Consolidated instrumentation is helping to win the battle against air pollution

Consolidated Titrilogs, both stationary and portable models, serve in the nation's growing battle against air pollution. Titrilogs are used for pin-pointing sources of toxic air contamination and for continuous, automatic recording of varying concentrations of sulfur compounds. Audible warning against dangerous sulfur compounds in traces as low as 0.1 part per million is a feature of these sensitive instruments that are safeguarding growing numbers of industries and communities. Request Titrilog Bulletin CEC-1810B-X5.

Consolidated Analytical Mass Spectrometers also play an important part in the scientific attack on air pollution by positive identification and measurement of pollutants in air samples. This type of smog analysis is being carried out by many research foundations and industrial laboratories in an effort to track down sources and explain the formation of smog. Write for Analytical Mass Spectrometer Bulletin CEC-1800B-X20.



Consolidated Engineering

300 North Sierra Madre Villa, Pasadena 15, California

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LATEX THREAD — makes it smoother, more uniform . . . improves dip and extrusion characteristics.

LIQUID STARCH — Stops separation. Improves transparency and clarity.

PIGMENT DISPERSION — gives a finer, more uniform suspension with less temperature rise.

LUBRICATING OIL — improves lubricating value and stability. Increases service life.

CREAM OIL — Looks less greasy, feels less greasy... spreads quicker, holds better.

COSMETIC EMULSION — Has a smoother texture, longer shelf-life. Perfume is locked-in against evaporation.

WAXES — for uniform, stable emulsions and viscosity control.



Werwick Division of Sun Chemical Co. uses this 500 GPH Gaulin to process its water repellent mixtures into uniform, stable emulsions.

And there are many more, each with its own set of reasons for using Gaulin Homogenizers. But there's one they all agree on — Gaulin Homogenizers are a FASTER, MORE ECONOMICAL

way to make uniform and stable emulsions or dispersions.

Why not investigate today. Complete testing facilities and engineering advice are yours without obligation.



GAULIN PILOT PLANT HOMOGENIZER

Ideal for experimental purposes, operation or process requiring up to 25 gallons per hour capacity. Handles quantities as small &s one pint. Available on low rental basis.



GAULIN TWO-STAGE

Stator is jacketed for cooling or beating. Gap setting adjustant ablefor, 001" o. 045".
Only 45 seconds clean-up required in changing colors, 12" head room, 12" x

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MANUFACTURING COMPANY, INC.

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Warld's largest manufactures of Hamagenizers, Triplex Stainless-Steel High Pressure Pumps, and Colloid Mills



• To be sure that "Buffalo" rotors can stand far greater stress than they would ever encounter in an installation, we deliberately try to destroy them in this "Buffalo" vacuum test pit! Here, in a partial vacuum, the rotor to be tested can be revolved at tip speeds as high as 60,000 and even 70,000 feet per minute. The slightest unbalance, the slightest structural weakness, would result in destruction of the rotor at these fantastic

speeds — and it shows up here in the Punishment Pit, not in the installed fan.

This is just one phase of the rigid testing and excellence of engineering, or "Q" Factor*, which assure you of a best buy when you specify "Buffalo" Fans. Why not write for "Buffalo" engineering literature on your air handling problem?

*The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.



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Publishers of "Fan Engineering" Handbook Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

VENTILATING PRESSURE BLOWING AIR CLEANING COOLING AIR TEMPERING HEATING INDUCED DRAFT FORCED DRAFT EXHAUSTING

Preventing high-volt leaks with PERMUTIT demineralized water

THE 75' diameter atomic accelerator shown below has five times more power than any other. Its 2200 ton electromagnet quickly whips particles three million times 'round the racetrack to an energy approaching 3 billion electron volts.

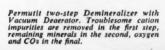
Packing all this power into a reasonable-size unit was a problem. Size ruled out air cooling. So the bus-bar magnet coil was made for circulating cooling water.

But at 3,000 volts, the dissolved minerals in *untreated* cooling water could conduct electricity, causing appreciable leakage to grounded piping. A means had to be found for producing water purer than conventional distilled water—at low cost.

A Permutit Demineralizer was selected (see diagram). Cooling water recirculated through this ion exchange unit approaches the very low conductivity of pure water, hence it has been completely effective in removing dissolved solids.

Find out how Permutit can solve your water problems. Write to The Permutit Company, Dept. CE-3, 330 West 42nd Street, New York 36, N. Y., or Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

The giant Cosmotron at Brookhaven National Laboratory.



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TREATED WATER
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ION EXCHANGE AND WATER CONDITIONING HEADQUARTERS FOR OVER 40 YEARS

PROTECTS AGAINST

CORROSION!

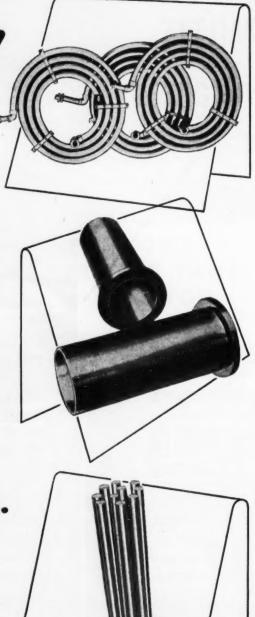
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... Makes the corrosion resistance of platinum available for industrial use at reasonable cost! Platinum Clad is pure platinum — or a suitable precious metal alloy — bonded throughout to a base metal support... It can be spun into desired shapes, drawn into seamless tubing or fabricated into shapes of interest to the chemical industry... The platinum thickness can be as low as .005" with assurance that the surface is free of pin holes... Remember — that the platinum values are recoverable so that unequalled corrosion resistance can be obtained for little more than the cost of other special alloy equipment.

Write for Booklet 96 giving complete details.

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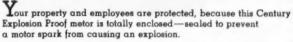
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- Vital motor parts protected sealed into inner frame.
- Motor can be reversed without changing direction of the fan fan runs in either direction.
- Uniform ventilation surrounding outside of inner frame.
- Smooth, straight-through ventilating passages.
- Winding electrically insulated 6 different ways.
- Unusually free from vibration.
- Ball bearing housing keeps grease in — dirt out — lubricated for several years' normal service, with grease plugs for additional lubrication, if necessary.
- Easy-to-remove fan guard is held securely in place with two screws.
- Smooth exterior surface is easy to clean.
- Cast iron frame with integrally cast feet resists rust and corrosion — even when mounted in places where processed materials may contact the feet.
- Rugged construction gives generous safety factor for rough handling.



Class I, groups C and D are used in atmospheres containing flammable gases or vapors: Ethyl ether vapors, gasoline, petroleum, napthha, alcohols, acetone, lacquer solvent vapors and natural gas.

Class II, groups E, F and G are used in atmospheres containing combustible dusts: Metal dust, carbon black, coal or coke dust and grain dusts.

Naturally, corrosive or abrasive materials in the air are also sealed out of the vital parts.

For your protection, specify Century motors on new equipment or for replacement. Your nearby Century Distributor will be glad to give you full information on the complete line of Century motors—from 1/8 to 400 horsepower. We are limited in some sizes of the Explosion Proof motor.





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CE-760

Both... Wide Speed Range 11.0 9.0 520 7.5 420 6.0 358 4.7 280 4.0 230 3.2 190 2.7 155 2.2 125 Every FALK Motoreducer has these "In-built" Factors-

Wide Speed Range. Selective ratio combinations provide output speeds from 1.5 rpm to 1430 rpm with stock gears.

Sealed Housings. Dual closures and oneway vents keep oil in, dust and moisture out. Units are splash-proof, leakproof, dustproof.

Precision Gearing. Heat treated alloy steel, precision cut and shaved helical gearing throughout . . . quiet-operating crown shaved pinions . . . taper bored gears for easy ratio changes.

All-steel Housings. Unbreakable, strong, rigid. Generous overhung load capacities provided by wide bearing spans, large shafts and bearings.

Streamlined inside and outside. Smooth, clean surfaces; machine welded construction conforms to NEMA motor frames.

Positive Lubrication. Large sump capacity
... oil-light construction assures clean lubricant ... direct dip of revolving elements provides positive lubrication at all speeds.

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THE FALK CORPORATION 3001 W. Canal St. Milwaukee 8, Wis.

use <u>complete</u> motors with <u>no</u> modifications

oreducers

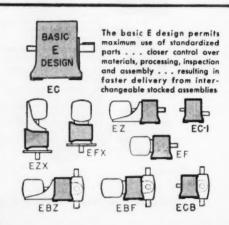
... another important reason why you should consult FALK!

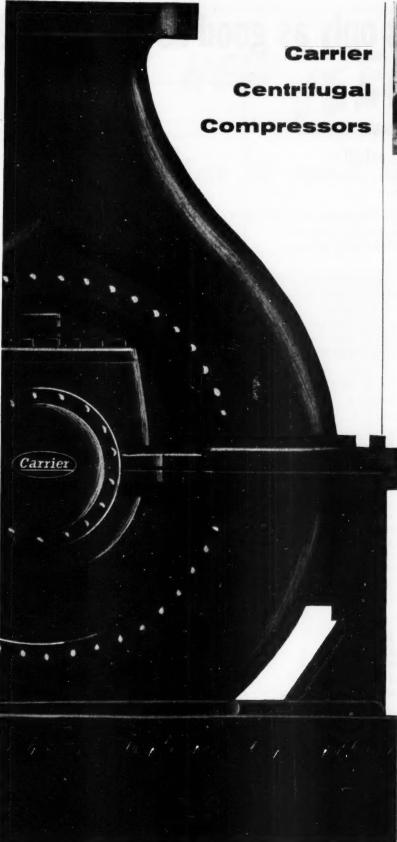
You never have the annoying problem of motor modification when you standardize on all-steel FALK Motoreducers. Both the universally popular All-Motor type and the newly redesigned Integral type use completely standard motors without modification. The motor can be quickly and easily replaced by another standard motor of any make, type or speed within the unit's AGMA rating when necessary without disturbing the reducing unit.

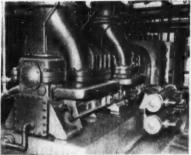
Many users choose the All-Motor type because it permits easy interchange of motors, or even parts, on the job, in minutes—and because reducer units and/or motors may be readily transferred from one line or plant location to another. Other users select the new Integral type with standard D-flange NEMA motor because it is a highly compact, streamlined unit providing the utmost in space economy.

In every FALK Motoreducer—All-Motor or Integral—the output speed (ratio) can be changed within the unit's torque capacity without modifying the motor.

Both types give you all the quality, adaptability, dependability and long-range economy for which FALK has been celebrated for more than sixty years. FALK Motoreducers are available from factory, field or distributor stocks throughout the country. Write to Department 247.







on the job at Tennessee Eastman

These are two of the four Carrier Centrifugal Compressors on the job at Tennessee Eastman's Kingsport plant. Two more Carrier units are installed at Texas Eastman's Longview plant and another two are on order.

Carrier makes a complete line of centrifugals for gas compression and refrigeration—up to 10,000 hp in a single unit. There are hundreds of these dependable, efficient Carrier machines on the job in chemical plants across the country—serving companies like American Cyanamid Co., Dow Chemical Co., Reichhold Chemicals, Inc., Union Carbide & Carbon Corp., Wyandotte Chemicals Corp. May we assist you?

If you'd like a copy of our booklet, "Centrifugal Compressors for Industry,"

call your nearest Carrier office. Or write direct to Carrier Corporation, Syracuse, New York.



centrifugal compressors refrigerating equipment

STEAM...is only as good as you use it!

Use steam the right way to reduce production costs, improve product quality and output—

When production slow-downs, high costs, and poor product quality occur, don't always blame the process equipment – often the fault is in the way steam is used.

For example, waterlogging caused by improper trapping or poor steam circulation, seriously affects heat transfer, reduces output, and creates production bottlenecks. Improper air venting does the same. Poor temperature control can lower product quality, cause rejects and further raise production costs.

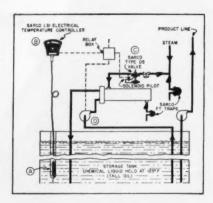
If your plant is suffering from any of these production handicaps, Sarco can help you.

Plant after plant has benefited from Sarco's experience in the process industries. The complete line of Sarco steam traps and temperature controls enables Sarco engineers to offer impartial, expert recommendations on how to make steam work best in your plant.

Why not call on Sarco for engineering recommendations next time you need help. For case histories describing how other plants in your field solved similar problems, write today to Sarco Company, Inc., Empire State Building, New York 1, N.Y.



improves product quality and output



Making Tall Oil Behave

A nationally-known detergent manufacturer uses tall oil in one of its products. Stored in tanks and pumped to vats on upper floors, the liquid must be kept at 125°F to avoid damage to pumps and heat exchanger.

Until recently, the liquid was heated by an exchanger using hand control of the steam valve. This proved costly since it was almost impossible to keep the liquid at the desired temperature.

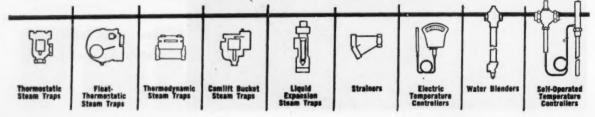
Sarco suggested the installation above. The Electric Temperature Controller (B) opens steam valve (C) and simultaneously starts pump (D) whenever temperature drops below 125° F.

Result: shutdowns eliminated, product quality improved . . . another example of how Sarco engineering know-how helped solve a temperature control problem by proper use of steam. Write for Case History 119.

SARCO ELECTRIC TEMPERA-TURE CONTROLLER holds liquids to ± 1°F. Temperature setting may be easily changed by turning one small knob. Write for Bulletin 1025-A.



STEAM TRAPS . TEMPERATURE CONTROLLERS . STRAINERS



NEW VEELOS

TD and TE Adjustable V-belts

for D and E Drives

The second secon

...<u>easier</u> to couple and uncouple
...longer lasting

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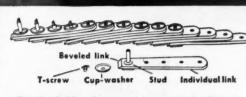
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Now get the v-belt that's been especially developed for D and E drives—the new, patented Veclos TD and TE adjustable v-belt!

This new Veelos has advantages unmatched by any other v-belt. It is installed quickly without removing the outboard bearings found on most D and E drives. It is the easiest v-belt to couple and uncouple ever developed. Cup-washera and T-screws join links together to form individual belts of any length. Veelos TD and TE lasts longer because new high-tensile strength links plus the new stud, cup-washer and T-screw design give added strength—combines this added strength with maximum flexibility for cooler, smoother running.

Install this new Veelos TD and TE v-belt on your D and E drives. Prove to yourself why there's no v-belt that can match the performance, the efficiency and the economy of Veelos TD and TE.

Get the complete story of this great new v-belt for D and E drives. Send the coupon now for new 8-page illustrated catalog.



This detailed line drawing of the new Veelos TD and TE v-belt makes it easy to see how this new v-belt is designed to do a better job...easier!

Veslog is known as Veslink outside the United States.

Veslog is known as Veslink adduction and the United States.

MANHEIM MANUFACTURING & BELTING CO. 602 Manbel St., Manheim, Pa.

Please send copy of your new Veelos TD and TE v-belt catalog.

Name.....

Address

ADJUSTABLE TO ANY LENGTH . ADAPTABLE TO ANY DRIVE

ONLY FULLER GIVES YOU THIS SELECTION

FULLER-KINYON

IN AIR

CONVEYING

THE

BIG

THE
RIGHT
CONVEYOR,
IN THE
RIGHT PLACE,
TO DO
THE JOB
RIGHT!



F-H AIRSLIDE

Fuller Company occupies a position unique in the field of conveying dry, pulverized and granular materials with air. It designs and builds four basic, primary types of conveying systems, from which it can select one, or possibly a combination of two or more systems to best meet specific requirements and operations in your plant. In other words, Fuller is not restricted, or tied down, to just one system for conveying various materials, which have many different characteristics. Fuller need not substitute; it can design and furnish the system best adaptable to the materials to be handled.

Add to all this, Fuller's 26 years of experience in the field of air-conveying, gained by designing and building hundreds of installations, and you purchase quality, plus!

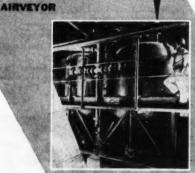
The next time you are faced with a conveying problem for dry, pulverized and granular materials, call on a Fuller engineer for practical experienced advice. This is a Fuller service—with no obligation.

Write for Bulletin G-1.

FULLER COMPANY, Catasauqua, Penna.

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DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—COMPRESSORS AND VACUUM PUMPS—FEEDERS AND ASSOCIATED EQUIPMENT

G-80



the blower that keeps air fresh

Your men can't produce at top efficiency when stagnant, hot or fume-filled air robs them of their energy.

Wherever bad air slows down production . . . in shipholds, tanks, drums, boilers or other places where men need fresh, cool air . . . a Coppus Blower becomes both a safety device and a production tool.

Portable and easily adaptable for special purposes, Coppus "Blue Ribbon" Blowers

and Exhausters fit all your "fresh air" requirements. The Coppus "Blue Ribbon" means premium performance at ordinary cost. Check and mail the coupon for specific information. Sales offices in THOMAS' REGISTER. Other "Blue Ribbon" Products in CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG, BEST'S SAFETY DIRECTORY, MINING CATALOGS.

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In tanks, tank cars, drums, etc. in underground cable manholes. in underground fusilages, wings, etc. on coke ovens. on steam-heated rubber processes.	on boiles repair jobs. COOLING: motors, generators, switchboards. wires and sheets. general man cooling. around cracking stills.	exhausting welding fumes. stirring up stagnant air wherever men are working or material is drying. drying of walls, heets; etc., after treated with coating material.	NAME COMPANY ADDRESS CITY
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DEVELOPER

TYGON TUBING — as used in an automatic picture taking machine. Here the clarity, flexibility, and resistance of TYGON to photographic chemicals has greatly increased service life, simplified operation, and minimized maintenance as compared to that obtained with rubber tubing.

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quickly applied, fast drying protection against corrosive fumes and spillage.

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long lasting, heavy duty sheet TYGON to withstand virtually all chemicals.

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accurate, durable parts and fittings of outstanding chemical resistance for all types of equipment.

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EASILY SOLVED WITH

TYGON

Every day, tough piping problems — big and small — are being solved with versatile, plastic TYGON TUBING. Designers and engineers, throughout industry, are finding TYGON the quick, easy, positive answer to tricky transmission jobs involving liquids, gases, or semi-solids. TYGON Tubing not only resists acids, alkalies, oils, greases, certain solvents, and water — but is glass-clear and fully flexible. TYGON also is strong, smooth-surfaced, abrasion-resistant, light in weight, and non-oxidizing. Certain formulations are completely non-toxic.

TYGON's excellent chemical resistance permits its use with virtually any corrosive. Its clarity permits full solution visibility and control. Its flexibility permits the most intricate use without kinking. Its smooth surfaces give maximum flow, easy cleaning, and free draining. Its non-toxicity assures complete safety in food, beverage or medical applications.

TYGON Tubing is made in continuous lengths and a number of stock sizes ranging from 1/8" ID to 2" ID. There are six standard formulations available in clear or glossy black which exhibit a range of physical, electrical, and chemical properties. Braided jacket reinforcement of stainless steel, Saran, or cotton is available and suggested where high constant pressures are encountered.

Special compounds and sizes — including rigid tubing — to meet specific requirements can be made where volume warrants.

Write, today, for more information and technical assistance on the use of TYGON Tubing. Ask for Bulletin-77. Ask also about the other forms of versatile TYGON that can help you combat corrosion.



AKRON 9, OHIO



PLASTICS AND SYNTHETICS DIVISION

THE Chementator

Prepared under the direction of Joseph A. O'Connor, News Editor

- At its Louisville, Ky., plant National Carbide, a division of Air Reduction, is trying out a new installation for pelletizing calcium carbide. This is expected to result in a better form for controlled feeding to acetylene generators.
- Prices of staple fibers have tumbled. Du Pont has reduced nylon staple and its Orlon acrylic staple to \$1.50 per lb. and its Dacron polyester staple to \$1.60 a lb. Chemstrand has cut its Acrilan acrylic fiber to \$1.40 per lb. Wool has been selling at \$1.73.

Big expansion in byproduct uranium?

A whopping expansion, conceivably costing as much as \$100 million, may be in the works for Texas City Chemicals, Inc., as a result of a recent visit by two AEC officials.

Dr. George G. Marvin, assistant director of the raw materials division of AEC, and E. F. Greenleaf, a chemical engineer for AEC, recently toured the plant at Texas City where the company turns out uranium as a byproduct of the manufacture of dicalcium phosphate. All the uranium recovered by Texas City Chemicals goes to the AEC under a 10-year contract.

Dr. Marvin is pleased with the operation at Texas City and with the progress in research.

If this research on the process is successfully completed within the next few months, as anticipated by S. A. Winfrey, executive vice president of Texas City Chemicals and general manager of the plant, the AEC might authorize the building of a much larger plant, perhaps with work starting this fall. An outlay of \$100 million would far exceed the \$8.5 million cost of the present plant, completed last year. However, it is not at all certain as yet that this new project will go through.

Fast amortization for pollution control?

Facilities for abating atmospheric or stream pollution may get fast tax writeoffs. Congress is now considering a general overhauling of the tax structure, and the House Ways & Means Committee has before it many recommended changes in the tax laws, including several bills authorizing accelerated amortization of pollution abatement facilities.

Representative John Byrnes of Wisconsin, and Representative Richard Simpson of Pennsylvania, both Republicans, have each introduced bills calling for amortization of water pollution prevention facilities in five years. Representative Carl Elliott, a Democrat from Alabama, has likewise introduced a measure for the same purpose. And a California Republican, Representative Carl Hinshaw, has submitted a bill authorizing amortization in five years on facilities for collecting at the source atmospheric pollutants and contaminants.

Expenditures for water conservation and pollution abatement do not usually produce revenue. Outlay to prevent air pollution likewise is not normally productive of revenue. Hence it might be advantageous to industry if it could amortize these non-revenue producing facilities in five years rather than over their useful life.

Novel atomic reactor works like water boiler

A nuclear reactor, dubbed the "water boiler," has been placed in operation at the Livermore, Calif., research center of the U.S. Atomic Energy Commission. California Research & Development Co., a subsidiary of Standard Oil Co. of California, is one of the major AEC contractors at Livermore.

This reactor, which was designed and built by North American Aviation, Inc., consists of a stainless steel sphere containing a solution of uranium sulfate dissolved in water. The sphere is 1 ft. in diameter. To make the reactor operate with the small amount of material contained in the sphere, the uranium has been enriched with the fissionable isotope U-235. The steel sphere is embedded in a stack of graphite bars contained in a heavy steel tank 5 ft. in diameter and 5 ft. high.

Surrounding the tank are several inches of lead to provide shielding from radiation produced by the chain reaction. To provide additional protection for the physicists and engineers using the reactor, a wall built up of 3 ft. thick concrete blocks surrounds the reactor assembly. The reactor sphere and surrounding graphite are pierced by many holes to give access to the intense nuclear radiations present during operation. One hole, known as the "glory hole," passes completely through the center of the sphere, the graphite and the surrounding shielding.

The reactor is controlled by two cadmium rods and two safety rods made of boron. The cadmium rods are normally used to control the reactor at the required power level, the other two can be used to shut

off the reactor, or for emergency control.

Normally, the "water boiler" will be operated at a power level of 100 watts. At this level, a large flux of thermal neutrons, one billion per square centimeter per second, will be available for experimental use. The reactor is designed for an increase in power level to 2,000 watts if required by future research.

An ultra-safe nuclear reactor, the "water boiler" not only has complex control and safety features as an integral part of its design but also has an invaluable natural safety mechanism. If the reactor should get out of control, the immediate effect would be a large release of heat. This will cause the water solution in the reactor to boil over into a retention drum, immediately stopping the chain reaction. Because of this feature, the "water boiler" is recognized by all atomic researchers as one of the safest reactors.

Hyperformer for California refinery

Calstate Refining has broken ground at Signal Hill, Calif., for a commercial Hyperforming unit. It will use Union Oil's new process for desulfurizing and upgrading the octane rating of straight and thermally cracked naphthas. When completed in mid-August the \$300,000 unit will be able to handle 1,100 bbl. per stream day.

Union's Hyperflow technique will be utilized for continuous regeneration of the catalyst, which consists of cobalt and molybdenum oxides impregnated on a special alumina base. Sulfur content of the charge stock will be reduced from 0.06 to 0.0009 percent.

Para-xylene by fractional crystallization

Continuous fractional crystallization is now being used by Phillips Chemical Co. in its new plant near Big Spring, Tex., to produce high-purity para-xylene. This plant, according to Phillips, is the first to make para-xylene of 98 percent minimum purity in commercial quantity. It can turn out 5 million pounds per year.

The new plant is next to the refinery of Cosden Petroleum Co., which furnishes the mixed xylenes charged to the Phillips unit.

Tank cars of para-xylene are now highballing to Du Pont at Gibbstown, N. J. An important use for paraxylene is its oxidation to terephthalic acid, starting material for Dacron synthetic fiber.

Phillips developed the new process for continuous fractional crystallization. It promises to find uses in other industries for making difficult separations of liquids.

More phthalic capacity for Sherwin-Williams

Stepping up production of phthalic anhydride, Sherwin-Williams has decided to double the capacity of its Chicago, Ill., plant. This would lift the plant's capacity to 6 million pounds per year. Facilities for the manufacture of a completely refined product will be installed.

Sherwin-Williams says the cost will be \$750,000, much less than the \$1,287,200 at 50 percent that appeared earlier in the certificate of necessity that was applied for. Sherwin-Williams also claims to be the first to operate a fluid bed type unit to make phthalic.

Chemico takes over cobalt refining operation

To achieve successful commercial operation of its new chemical refining process for metals, Chemical Construction Corp. will take over the management and operation of the new cobalt refining plant of Calera Mining Co., a subsidiary of Howe Sound Co., at Garfield, Utah, for two years.

The plant has been in partial production since late 1952. Chemico, a subsidiary of American Cyanamid, designed and constructed the plant. Howe Sound has agreed to let Chemico step in to place the operation

on a successful commercial basis.

Cobalt concentrate will be sent by Calera from its mill at the Blackbird mine in Idaho. It will be processed by Chemico for Calera on a toll basis.

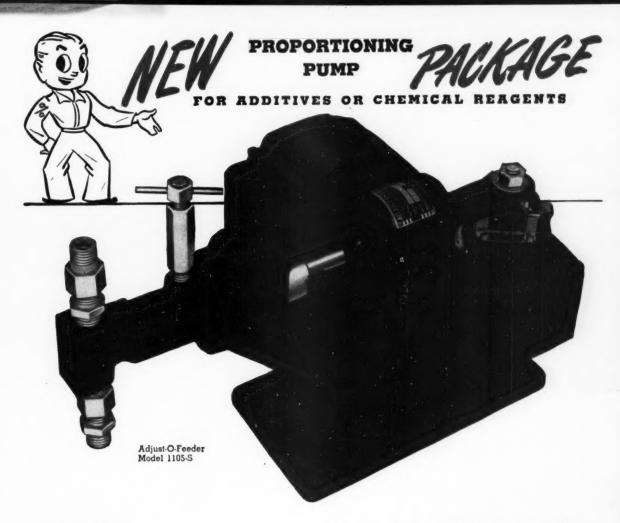
The plant is the first to use Chemico's new process for recovering cobalt metal from ore concentrate. This process employs chemical techniques exclusively. It is less costly than conventional smelting and refining.

Michigan plant to boost neoprene output

Du Pont will build a \$15 million plant at Montague, Mich., to produce neoprene. Construction will start later this year on the 1,000-acre site that Du Pont has optioned, and initial operation is expected early in 1956.

The Du Pont plant will be next to the chlorinecaustic plant of Hooker Electrochemical Co., now under construction at Montague. It will also adjoin the site of a plant to be built by Union Carbide & Carbon in which Linde will produce acetylene. Cal-

(Continued on page 110)



- LOW COST
- COMPACT

Built-in standard motor — no separate gearbox or couplings.
Built-in oil-enclosed gear reducer.

- MICRO-STROKE ADJUSTMENT Scale easily read —crank and connecting rod operate in horizontal plane.
- LONG LIFE AND EASY MAINTENANCE One-piece Meehanite iron frame for positive alignment of all moving parts. Double check valves on suction and discharge easily removable.

This new, compact proportioning pump, by %Proportioneers, Inc.%, is inexpensive and meets most requirements for a low capacity, medium pressure chemical feed pump. The standard Model 1105-S has a capacity range from 1 to 10 GPH and will discharge against pressures up to 650 psig. For lower feeds, the unit is available with a range of from 0.5 to 5 GPH. Complete and self-contained, Model 1105-S weighs less than 100 lbs. and is ready to operate.

Ask for Bulletin 1105

Write to %PROPORTIONEERS, INC.%, 369 Harris Ave., Providence 1, R. I.

Technical service representatives in principal cities of the United States, Canada, Mexico and other foreign countries.

From Incoming POWER to Operating POWER



Complete Electrical Distribution Equipment for Electrochemical and Electrothermal Industries

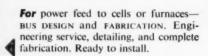
Four cooperating I-T-E Divisions provide unified, coordinated service.

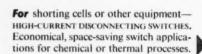
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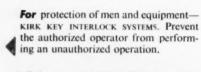
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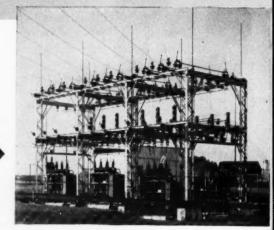
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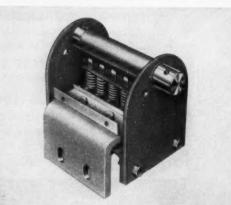






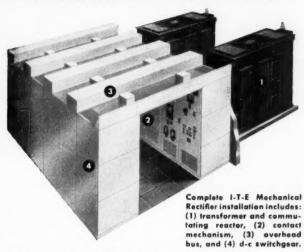
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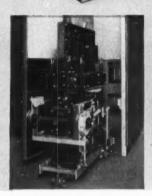
D-C Circuit Breakers

For interrupting heavy direct currents, as for protection of rotating machines and recti-fiers, I-T-E provides speciallydeveloped circuit breakers combining very rugged con-struction with fast circuit-opening and reliable are extinction. Available auxiliary devices make these circuit breakers widely applicable.











Pullbox-mounted Urelite with all live parts enclosed for safety and dependable performance.

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cium carbide for the generation of acetylene will be

shipped from Sault Sainte Marie.

Hooker will supply anhydrous hydrogen chloride and Union Carbide will furnish acetylene, the principal raw materials for neoprene. Both will be piped into the new Du Pont plant.

Added capacity is needed, according to Du Pont, to meet the rising demand for neoprene. Currently, Du Pont produces the synthetic rubber at its Louisville, Ky., plant, where an expansion is also under way.

Magnetic amplifiers in chlorine-caustic lines

Magnetic amplifiers in series are used by Columbia-Southern Chemical Corp. for metering current in chlorine-caustic soda lines in one of the first installations to measure total direct current from more than one rectifier. For producers of electrochemicals this is a significant development.

In this operation, magnetic amplifiers are used because they electrically isolate the recording instruments from the cell line bus bars and eliminate the cost of installing a large shunt in the main bus by totalizing the output of individual rectifiers. Any number of magnetic amplifier units can be connected in series to

totalize the largest systems.

"The first reason was important," explains Columbia-Southern's E. A. Downing, "because it removed bus potential from the instruments, thus eliminating a major cause of instrument failure, and removing the hazard to instrument mechanics of coming in contact

with the high voltage."

Advantage of eliminating the large shunt totalizing unit was largely economical, he explains, as the cost of the magnetic amplifiers at the time was less than the cost of a 50-MV. totalizing shunt of adequate capacity. It turned out that a greater saving was realized by being able to omit several feet of bus to the cell line, saving nearly a ton of copper; another saving was in the decreased loss of current.

"The total losses of four magnetic amplifier units would be less than 1½ watts," according to Downing, "where the losses in a 20,000-amp. 50-MV. shunt would be 1,000 watts, which amounts to more than 8,000 kwh. per year."

Trend to automatic chemical plants increases

The chemical industry, growing 10 percent annually compared with 3 percent for all industry, may soon become the first major industry to automatize its manufacturing operations almost completely, according to C. W. Bowden, Jr., chemical industry manager for Minneapolis-Honeywell's Industrial Division in Philadelphia.

Both the chemical and the petroleum industries are using more and more automatic controls. More than

40 percent of all instruments sold go to oil refiners and producers of chemicals.

In the chemical industry alone, Bowden points out, the percentage of total plant investment going for instrument purchases has increased nine times since 1930.

As a result of the chemical industry's increasing use of new continuous processes with more and more automatic instruments, today's volume of production of chemicals and allied products in the year ended August 1953 totaled more than \$20 billion, as contrasted with less than \$4 billion in 1939. Eliminating the influence of price changes, this comes to a 200 percent increase in physical volume. This means that today's volume is three times what it was 15 years ago.

Bowden isn't worried about the effect of any letup in industrial and business activity. He thinks the chemical industry can adjust itself to any changed pattern that might occur. The ability of chemical manufacturers to switch output from one product to another, together with the continuous development of new products, is the basic reason for optimism about the industry's stability.

Research, too, has not only reduced man-hours per unit of output but has enabled the producers to diversify their product line. New products introduced during the postwar period alone now comprise more than half

of the chemical industry's product sales.

As a result of this technological trend, Bowden envisions the chemical plant of the future as more selfsufficient and more efficient than those of today. For example, it will not have two-thirds of its inventory tied up in storage tanks and liquid inventory. Servo-mechanism techniques will eliminate the need for keeping inventories of goods in process at each stage of the production process.

Instead, the servo techniques will permit the system to correct for errors without disrupting the production operations. Thus relationships between the various production phases will be maintained. Inventories of goods in process, standing idle, will no longer be needed to smooth over production lags. Furthermore, Bowden anticipates that the costs of the controls themselves might be offset by this contraction of inventories of goods in process.

Increased ammonia capacity for Dow in Texas

Dow Chemical is expanding its ammonia production facilities. The expansion now under way at Dow's Freeport, Tex., plant when completed late this year will approximately double the present capacity. Operation of the added facilities is expected to begin in early 1955.

No large increase in the size of the ammonia plant will be required for the increase in capacity. New compressors, converter and refrigeration equipment are being installed. Small additions are being made to the

(Continued on page 112)

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compressor building and the converter structure. Austin Co. is handling the job.

Ammonia production began at Freeport in October 1950. Dow manufactures ammonia by combining by-product hydrogen from its chlorine process with nitrogen from the air. Dow's ammonia output is marketed principally for use in fertilizers, as a refrigerant, and as a raw material for the manufacture of other products.

Koppers to produce polyethylene

Already an important producer of polystyrene, Koppers has now decided to get into the polyethylene business. Several plant sites are being considered, including Port Arthur, Tex., where Koppers operates a chemical plant.

A decision on the location of the new polyethylene plant is expected shortly. Actual construction will start this spring, and operation is slated for mid-1955.

Koppers will produce polyethylene in pellets for molders and extruders. Four major production areas will make up the plant, which will be the sixth operated by the Chemical Division of Koppers.

Synthetic detergents burst soap sales bubble

Synthetic detergents for the first time topped soaps in annual sales in 1953, according to Dr. Foster D. Snell, president of Foster D. Snell, Inc., of New York. With sales 24 percent above the previous record, set in 1952, the synthetic detergents now account for 53 percent of the United States market for all detergents, including soap.

This total market reached 3,578,000,000 lb. in 1953, up 5 percent over the previous year. And this was despite an 11 percent decrease in soap sales. The production of liquid synthetic detergents, only 2 percent of synthetic production in 1952, increased to 4 or 5 percent in 1953.

Some raw materials for soaps were priced lower in 1953. These lower costs, in effect, made it possible to price soap lower than synthetic detergents, probably lessening the swing to the synthetics.

A decrease in soap production means an excess of inedible tallow, the basic raw material. It also means a decrease in glycerine, which is a byproduct of soap making. Tallow is being used in greater amounts to produce industrial alcohol. And the gap in glycerine production is being filled by synthetic from petroleum.

Synthetic detergents continue to find new uses. They are used as lubricants for heavy rayons; for dispersal of fertilizer particles to prevent caking; in the manufacture of tire cord to increase the breaking strength; as emulsifiers in foods and in insecticides; in antistatic agents; in latex paints to make them more uniform; and in certain plastics.

Another earbon black plant for Louisiana

A new carbon black plant, using the oil process, will be built by Columbian Carbon Co. near North Bend, La., on the Intracoastal Canal. Its ultimate annual capacity: 60 million pounds.

More than \$3 million will be invested in the completed project. Construction is now in progress, and the first unit is expected to operate in November of this year.

Natural gas from nearby fields and liquid petroleum products from Gulf Coast refineries will be the raw materials for the new plant. Columbian will employ processes resulting from its most recent research and engineering developments in producing black.

Products of the new plant will be used principally by the rubber industry and will include a new superabrasion furnace black developed by Columbian research. This new black increases resistance of tire treads to abrasive wear by at least 25 percent. Products of the new Louisiana plant will go into tires for planes and trucks, into other rubber goods and into printing inks.

One of the world's largest manufacturers of carbon black, Columbian Carbon has plants in Louisiana, Texas, Kansas, Arkansas and New Mexico. Columbian also manufactures printing inks, iron oxide pigments and lamp black; it produces natural gasoline and sulfur from natural gas. It has extensive oil and gas interests in the United States and Canada.

Nitroparaffins on the rise

Moving toward volume production of nitroparaffins, Commercial Solvents will shell out \$5 million for the construction of large-scale facilities at Sterlington, La., and will also enlarge its nitroparaffin operations at Peoria, Ill. Full production is expected in the last quarter of 1955.

Basic products will be nitromethane, nitroethane, 1-nitropropane, 2-nitropropane and nitrobutane. Derivatives will include aminohydroxy compounds and hydroxylamine salts.

Nitroparaffins and their derivatives are finding uses in the manufacture of other chemicals, in agriculture, textiles, rubber products, petroleum, coatings, plastics, pharmaceuticals, aluminum and light metals, chemical specialties and military uses.

Commercial Solvents developed its nitroparaffin processes from initial research carried out at Purdue. Since 1935, CSC has been investigating the nitroparaffins and producing them experimentally for evaluation.

Construction of a plant for full-scale production of nitroparaffins is another step in the move into petrochemicals by Commercial Solvents. A \$20 million expansion has recently doubled CSC's methanol, ammonia and nitric acid capacity. These chemicals will be used in the manufacture of nitroparaffins.

(What's Happening . . . page 114)

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What's Happening

FEATURE NEWS

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Partial combustion of pulverized coal in steam and oxygen soon may narrow the present cost gap between coal-based and natural-gasbased chemical operations.



PILOT unit preceded commercial-scale trial now underway.

Du Pont Tries New Route to Synthesis Gas

By this time next year Du Pont should know whether it won or lost with its \$5.6-million gamble on a new synthesis gas process at Belle, W. Va.

If successful the new process, known as coal partial combustion, will replace the costly, air-polluting coke ovens and water-gas generators which for more than 25 years have been the heart of Du Pont's ammonia and methanol operations at Belle.

It would also open the way for use of low-grade, noncoking coals of any particle size. This means that the ammonia, methanol or FischerTropsch plant of the future wouldn't have to be located near a source of high-grade coal or natural gas.

Construction of Du Pont's demonstration unit is to be complete late this year. Complete conversion, if undertaken, would be done stepwise over a period of several years.

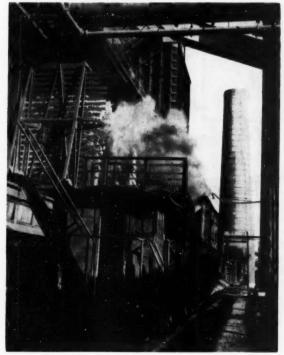
►Uses Pulverized Coal—The new process continuously burns pulverized coal in an atmosphere of steam and oxygen. It produces a synthesis gas which normally consists of about 40 percent hydrogen, 40 percent CO, 15 percent CO₃, less than 1 percent meth-

ane and about 4 percent inerts. Amount of oxygen used varies with coal analysis—on the order of 8 to 10 cu. ft. per lb. of coal—and is purposely less than that required for complete combustion.

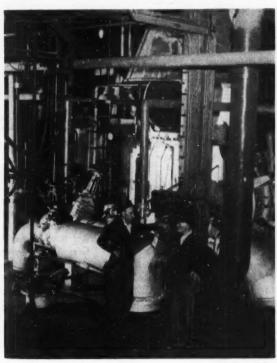
The gasifier consists of a twochamber, refractory-lined furnace with waste-heat boiler, superheater and economizer. In many respects it uses the basic design fundamentals of conventional pulverized-coal-fired, slag-tap steam-boiler furnaces.

A proposed full-scale design—which resembles in size the one being put

in Chemical Engineering



GONE will be these dirty, costly coke ovens and . . .



WATER GAS generators if new process pans out as hoped.

in by Du Pont—was described by Babcock & Wilcox engineers* to the ASME Fuels Division at its annual meeting in New York late last year. The gasifier is 15 ft. in diameter and 88 ft. high, with a capacity of about 17 tons of coal per hr., equivalent to 25 million cu. ft. of synthesis gas per 24-hr. day.

Auxiliaries for coal and ash handling can be standard central-station equipment, says B&W. Du Pont will be pulverizing its coal in fluid-energy mills, using steam as the high-velocity fluid.

► Joint Effort—Partial combustion of pulverized coal was developed jointly

by Babcock & Wilcox, Bureau of Mines and Du Pont.

First pilot plant, designed by B&W, went into service in mid-1951 at the bureau's Morgantown (W. Va.) station. Its reaction chamber is 30 in. I. D., with a nominal rating of 500 lb. of coal per hr. It has been used principally for studying a large number of variables; its longest run lasted 296 hr.

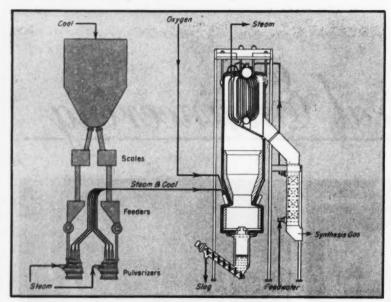
A larger unit, 5 ft. I. D., was put in by Du Pont at Belle in October 1951. Capacity is 3,000 lb. of coal per hr. It has operated for more than 5,000 hr., most of the time piping its product gas into Belle's chemical operations.

► Ash-Fusion Problems—Previous attempts at pulverized-coal gasification

are reported by the bureau to have met difficulty in handling coals with widely varying ash-fusing temperatures. One problem is that ash-fusing temperature under the reducing conditions of gas-making may be as much as 400 deg. F. lower than it is under oxidizing conditions. This is a function of the iron content of the ash.

Since the gasifier works best with highest temperatures in the primary (exothermic) reaction zone, and these temperatures are above usual ash-fusing temperatures under reducing conditions, B&W decided that slag-tap type of operation was the answer. Only disadvantage is that some coals with extremely high ash-fusing temperatures can't be used.

^{*}P. R. Grossman, superintendent, and R. W. Curtis, test engineer, of B&W's research center at Alliance, Ohio.



FULL-SCALE unit, designed by Babcock & Wilcox; rated at 17 tons coal per hr.

As in slag-tap boiler furnaces, the furnace is divided into primary and secondary zones, and the burners are fired in the general direction of the tap hole.

▶ Heat Losses—In modern boiler furnaces about half the heat in the fuel is absorbed by the furnace. This amounts to about 5,000-7,000 Btu. per lb. of coal.

For the endothermic gas-making reactions in the gasifier, maximum heat utilization is required. This makes it necessary to reduce heat loss to the walls as much as possible. A heat loss of 1,000 Btu. per lb. of coal will increase the material costs of synthesis gas by more than 25 percent.

This high cost of heat loss requires use of a refractory lining to keep heat absorption by the furnace at a minimum. B&W expects a full-scale gasifier to operate with a heat loss to the walls of about 200 Btu. per lb. of coal.

The refractory problem has come in for a lot of study. The lower chamber of the gasifier will operate with a layer of liquid slag covering the walls and is subject to the chemical and erosive action of this slag. Periodic replacement will probably be necessary. It is hoped, however, that this will be confined to the lower chamber, perhaps even to only a portion of it.

B&W's design calls for a generator built of boiler tubes with metal studs and plastic chrome ore applied as a monolithic structure. This type of construction has been widely used in boiler furnaces and has been able to withstand continuous operation with slag flowing over the chrome-ore surface. The entire gasifier is enclosed in a pressure-tight casing.

▶ Dirt and Dollars-Du Pont pegs its research and development costs over the past eight years at a healthy \$1.6 million. To build the plant-scale demonstration unit is taking another \$4 million. The cost of complete conversion to the new process, if successful, will be many more millions. Fortunately, Du Pont already has an oxygen plant at Belle, used in conjunction with the water-gas generators (see Chem. Eng., Oct. 1950, p. 237). The current project thus does not include any oxygen facilities. More oxygen capacity will be needed, however, for complete conversion,

Du Pont's public relations people emphasize the cleanliness angles of the new process. That the company takes its air-pollution problems at Belle scriously is vouched for by a brandnew \$2.3 million fly-ash abatement installation at the plant's power house.

But coal partial combustion looks good on a dollars-and-cents basis, too. Until now, Belle has made synthesis gas by blowing beds of coke with air (or oxygen) and steam. The coke was made by high-temperature carbonization of high-grade coal.

The new process would replace these two high-investment, high-labor operations with a single, streamlined, continuous one, using almost any grade of coal. It will narrow the cost gap between natural-gas-based and coal-based synthesis gas.

As Plant Manager Fred Otto puts it: "We hope the new unit will put what is essentially an old plant, as time is measured in the chemical industry, on a sound competitive foun-

dation for the future."

Ultraformer for Refinery Of Indian Standard

Standard Oil Co. will add a new catalytic Ultraforming unit to its Casper, Wyo., refinery. Design of the unit, which will process 3,750 bbl. per day, is already in the final stages.

Construction will be started by the Lummus Co. late this spring. Completion and initial operation are

planned for early 1955.

Other Casper refining units, including the catalytic cracking unit and facilities completed in 1949, will continue to operate. The alkylation unit now under construction, which will handle 700 bbl. per way, is expected to be operating early this hummer.

The new Ultraforming unit will provide improved products and greater operating flexibility. Off-site tankage and other facilities also will be built to integrate the new unit'd operations with the refinery.

Employing a process developed in the Whiting, Ind., laboratories of Indiana Standard, the Ultraformer will yield higher-octane gasoline.

Standard's new Ultraforming process converts straight-run naphtha in crude oil by the use of a platinum catalyst into a higher-antiknock material. A number of reactors are used. Each holds a bed of catalyst pellets.

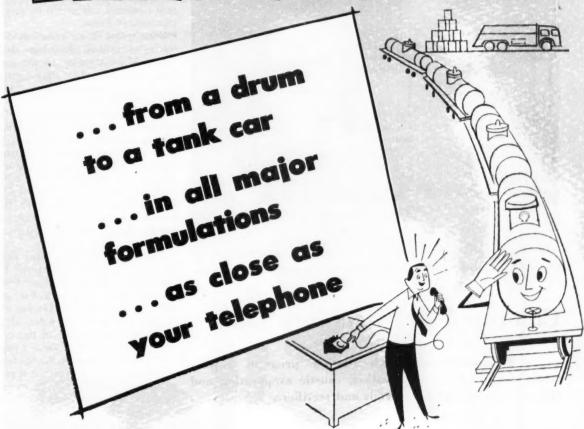
Catalyst can be regenerated without shutting down. Advantages of catalyst regeneration include: operation at low pressures; higher gasoline yields; higher octane; increased variety of feedstocks; and processing of stocks that would wear out other catalysts.

Ultraforming also yields increased hydrogen, a valuable by product of catalytic reforming. The Ultraforming unit at Casper is the fourth since the process was developed by Indiana Standard.

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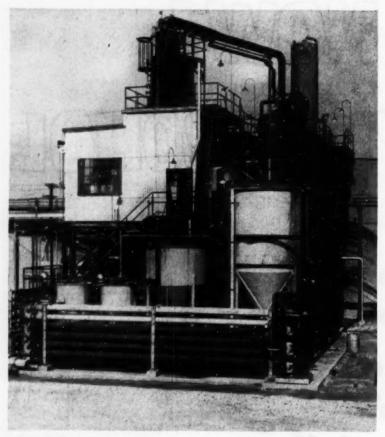
*Tank truck and drum availability west of Rocky Mountains is limited.

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Chlorine Plant Gets New Look

Expansion and modernization program applies latest ideas in brine purification, caustic evaporation and chlorine cooling, plus new cells and rectifiers.

Velsicol Corp., a division of Arvey Corp., has recently completed at its Memphis plant a \$2-million modernization project which incorporates the latest ideas in caustic-chlorine manufacture.

Revamping of the plant, built during World War II, has included the addition of 40 new Hooker Type S cells, bringing the total number of cells to 136. Plant output is now rated at 44 tons of chlorine and 55 tons of caustic per day.

Velsicol uses part of the chlorine in another unit at the Memphis works to make heptachlor, an insecticide especially useful against mosquitoes and boll weevils.* Byproduct hydrogen is piped to nearby manufacturers of hydrogenated vegetable oils.

Dorphaned War Baby—The original plant at Memphis was built by the Government during the war to make phenol by the chlorbenzene route. For a short time after the war, Heyden Chemical Corp. operated it. In 1950 Velsicol bought the plant to provide chlorine for manufacture of insecticides.

By that time the plant needed rehabilitation, so Velsicol engaged R. B. MacMullin Associates of Niagara Falls,

 Heptachlor is a close chemical relative of chlordane, having one less chlorine atom per molecule than chlordane's eight. N. Y., to work out a basic program for expansion and modernization.

All process operations have now been either put into good operating order or abandoned entirely in favor of new construction. Included in the new construction was a rock salt storage and brine purification system, a caustic evaporation system and more rectifier equipment, in addition to the installation of the new cells. Chlorine is now cooled in a new direct-contact cooling tower and liquefied in a vertical condenser refrigerated by direct expansion of Freon.

▶ Brine System—Brine is made by dissolving raw salt in three large steel tanks. Major impurity in the raw brine is calcium sulfate; other impurities are a small amount of magnesium and a trace of iron.

Ca, Mg and Fe are removed by continuous treatment of the brine with a solution containing sodium carbonate in an agitated steel tank equipped with an overflow launder. The overflow is pumped through clarifying sand filters. The sludge, which is periodically removed from the bottom of the treatment tank, is mostly calcium carbonate and magnesium and ferric hydroxides.

The sodium carbonate solution used for brine treatment is prepared by carbonating some of the liquor from the electrolytic cells with flue gas from the plant's boilers. The flue gas is first scrubbed with water, then blown into the bottom of the carbonator at a pressure of about 5 psig.

The sulfate remains in the cell feed as sodium sulfate. However, it is prevented from building up in the system by removing it from the recycle brine (see below).

Evaporation System—Treated brine is electrolyzed in Hooker diaphragm cells to produce chlorine gas and weak liquor containing about 11 percent NaOH, 15 per cent NaCl and 0.3 percent Na₂SO₄. The liquor is evaporated to 50 percent NaOH in a double-effect system using horizontal heaters. First effect vacuum is about 10 in. Hg, with second effect at about 27 in.

The hot 50-percent caustic is cooled in a series of 12 scraped-surface chillers, then filtered in a rotating leaf filter. Of the 12 chiller units, the first nine are water-cooled, the last three cooled with 30 deg.-F. brine.

Salt slurry is taken from the second

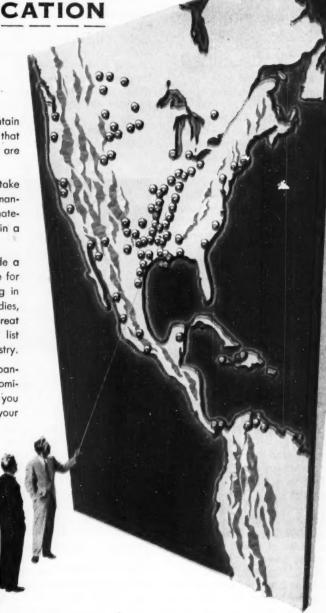
OPERATING COSTS...
AND PLANT LOCATION

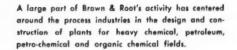
The ability of a company to make and maintain cost reduction is especially significant now that vigorous competition and a buyers' market are back.

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Associate Companies -- BROWN ENGINEERING CORP. . BROWN & ROOT MARINE OPERATORS INC.

Operating Cycle of Super-D-Hydrator

Screen rinee	2 sec.
Feed	10
Idle	20
Cake rinee	2
Idle	7
Brine rinae	8
Spin and unload	15
Total	64 sec.

evaporation effect and centrifuged in a Sharples Super-D-Hydrator operated automatically on the repetitive cycle shown in the table. The free solid salt removed here is returned to the brine system; the filtrate and wash liquors go to a Krystal vacuum crystallizer for sulfate removal.

The solution is cooled to 45 deg. F. in the crystallizer body by evaporation of some of the water at a vacuum of 29.5 in. Hg. Vacuum is produced by a three-stage steam jet system with two intercondensers. At 45 deg. most of the sodium sulfate in the brine crystallizes out and is removed from the system.

Chlorine System-Velsicol is trying a new wrinkle in chlorine cooling direct countercurrent contact of the cell gas with water in a vertical tower. In the system used previously the gas was cooled by running it through jack-

eted glass tubes.

The 40-in.-dia. by 32-ft. tower is made of steel lined with Pyroflex, a modified rubber-base resin, and is packed with a 19-ft. bed of Berl saddles. Cell gas at about 190 deg. F. enters the tower at a point about 7 ft. from the bottom, and as it rises it gives up heat to a descending stream of well water, which comes into the tower 10 ft. from the top at a temperature of 70 deg. In the upper 5 ft. of the tower, the gas is further cooled by a stream of chilled water which enters the tower near the top at 50 deg. F.

Chlorine is stripped from the water leaving the base of the tower by introducing low-pressure steam near the

bottom of the tower.

In addition to cooling the cell gas, the tower reduces its water content by the difference in saturation points between the incoming and outgoing gas temperatures. Theoretically, the exit gas at 55 deg. should carry only 1 percent as much water as the hot cell gas.

The cooled gas is further dried by scrubbing with sulfuric acid, then liquefied in a modern refrigeration system by heat exchange with evaporating Freon. Part of the abandoned

chlorine refrigeration system is used for chilling the water to the chlorine cooling tower.

▶ Past, Present, Future—Velsicol started in the early '30's to develop a synthetic drying oil from petroleum cracking products. This work led to the production of resins and solvents which were offered initially to the protective and decorative coatings industry.

More recently, the company has developed and put into production various commercial insecticides, such as chlordane and heptachlor. Endrin, Velsicol's newest insecticide, is being made at Memphis in semicommercial quantities. This product is said to be finding acceptance for control of both boll weevil and bollworm on cotton and of hornworm on tobacco.

With its caustic-chlorine supply now well established, Velsicol is in a good position to capitalize on the results of its research into new synthetic chlorine-based products.



Another Ammonia Plant for West

Anhydrous ammonia is now being produced in the new Ventura, Calif., plant of Shell Chemical Corp., built at a cost of about \$10 million. The plant will produce 150 tons a day. Together with Shell Chemical's ammonia plant at Pittsburg, Calif., it maintains Shell's position as the largest producer of anhydrous ammonia and ammonium sulfate west of the Rockies.

Most of Shell's ammonia production is earmarked for western agriculture; whose use of ammonia as a fertilizer has increased sharply in recent years. In 1942, the Rocky Mountain and Pacific Coast states used a total of 382,266 tons of fertilizer; in 1952, the farmers of California alone used 750,000 tons.

The 27-acre plant site, three miles north of Ventura, was chosen because of the rapidly growing need for ammonia fertilizer in California and Arizona, and because Shell's operations in the Ventura oil field will supply abundant natural gas for ammonia manufacturing.

Frank D. Kuenzly, formerly super-

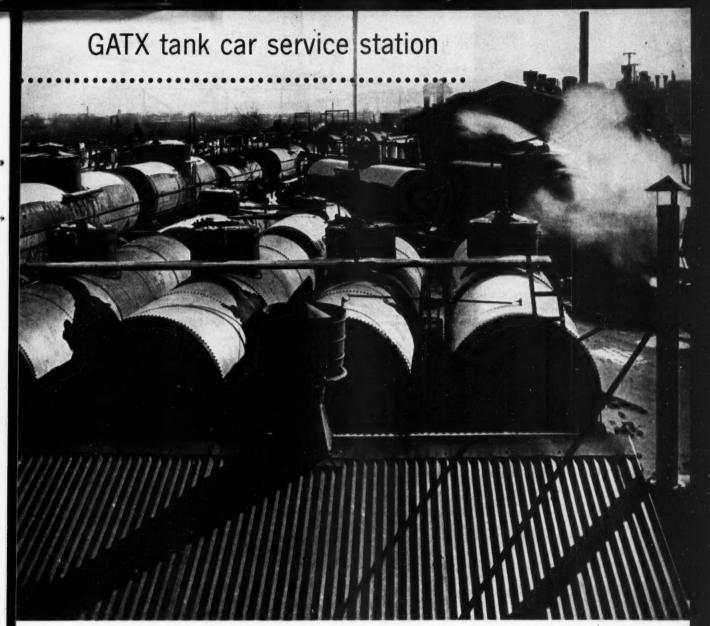
intendent of the Pittsburg plant, will be manager of the new plant, which will employ about 140.

Ammonia manufactured at the plant will, according to President R. C. McCurdy of Shell Chemical, help the nation to support its rapidly increasing population by making possible greater food production. Ammonia, containing 82 percent nitrogen, is recognized as the most effective method of supplying the soil with nitrogen for plant growth. Experts estimate that for each dollar spent on nitrogen fertilizer from two to ten dollars normally are returned in increased crop value.

The Ventura plant will also produce ammonia for use in industry for refrigeration, and for the manufacture of synthetic fibers, explosives, pulp

and nitric acid.

Shell first developed methods for applying ammonia directly to the soil as a fertilizer in the '30s. These methods of getting ammonia into the soil by direct injection or through irrigation water were pioneered by Shell and have since been widely used.



Steam rack where 24 tank cars can be cleaned at one time

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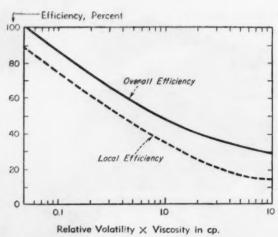
More than 30 General American repair shops give the 47,000 GATX tank cars their periodic steam-cleaning, lubrication, maintenance and inspection. Specialized equipment and parts inventories used in building more than 200 types of tank cars are also available for the repair and maintenance of the GATX fleet.

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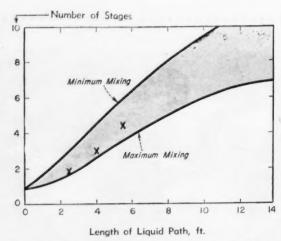


Fig. 1—PLATE EFFICIENCIES of fractionators will correlate Fig. 2—NUMBER OF STAGES or pools of liquid on a plate is with feed viscosity and relative volatility of key components. determined from the length of liquid path and degree of mixing.

More Exact Plate Efficiencies

New method determines over-all plate efficiencies of any diameter distillation column. Assumes a plate consists of successive stages of completely mixed liquid.

Two Ethyl Corp. engineers, M. F. Gautreaux and H. E. O'Connell, have come up with a new way to estimate over-all plate efficiencies of bubble-cap fractionating towers.* It's said to be, good for any tower diameter, large or small. Unlike the widely-used equation developed by W. K. Lewis, Jr., in 1936, it takes liquid mixing into account.'

Earlier work by O'Connell in 1946 showed that over-all column efficiency correlates with relative volatility and viscosity of the system (Fig. 1, solid line), except for columns with long liquid paths—diameter over 7 ft. In these cases, the concentration gradient of the liquid as it flows across the plate becomes significant, considerable mixing occurs and actual efficiencies are higher than predicted.

► Stage Concept—Basis of the new derivation is the assumption that a plate can be divided into stages, each consisting of a pool of completely mixed liquid. This, of course, is a hypothetical concept. Actually, the

pools overlap and performance would be better defined by the degree of mixing that occurs. But using it and other simplifying assumptions, the Ethyl engineers derived the following relationship between local and over-all plate efficiency:

$$E_{\bullet} = A[(1 + E_{p}/nA)^{n} - 1]$$

Over-all plate efficiency, E., is defined as the ratio of actual change in the average vapor composition divided by the change that would occur if the vapor leaving were in equilibrium with the liquid leaving. Local efficiency, E., is the approach to equilibrium at any point on the plate.

► Find E_r—To use this equation, you have to know the local efficiency and the number of stages, n. The first is hard to find since most experimental

NOMENCLATURE

E. Over-all plate efficiency

E, Local plate efficiency

L/Vm

L Liquid flow rate, any units

Vapor flow rate, consistent with L

m Slope of equilibrium curve

Number of stages on plate
 α Relative volatility

Viscosity, centipoises

determinations are unreliable owing to sampling difficulties.

However, Gautreaux and O'Connell found that E_P, like E_o in small columns, correlates with $\alpha\mu$ for most systems. Taking average values for A and assuming column and over-all plate efficiencies to be equal, they arrived at the dotted line in Fig. 1. It must be remembered, though, that for some systems the slope of the equilibrium curve is not proportional to relative volatility and local efficiency can't be predicted from Fig. 1.

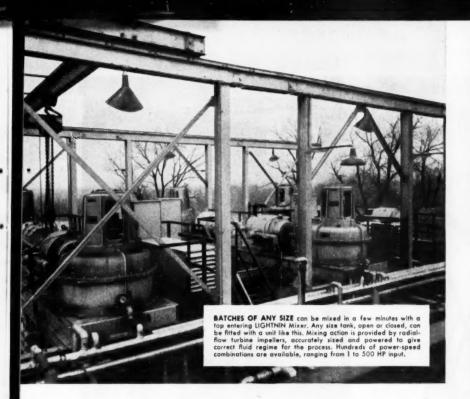
They also developed a graph (Fig. 2), based on literature data for commercial columns, that shows the effect of length of liquid path on the number of stages for high and low liquid rates. This is only an approximation, but Gautreaux and O'Connell feel that further data will not materially affect the range of the curves.

▶ How to Use It—Test results on a propane-butane fractionator illustrate the application of the new method. The plates have a liquid path length of 4 ft. Relative volatility of the system is 1.7 and the viscosity at average temperature and pressure is 0.095 cp.; $\alpha u = 0.16$; A = 0.6.

From Fig. 1, the local efficiency from the dotted line is 67 percent. From Fig. 2, with a liquid path of 4 ft. and a high liquid rate, the number of stages is 3.6.

Substituting into the equation, E_s = 0.95 or 95 percent. An average of five tests on the tower showed an over-all plate efficiency of 100 percent.

^{*} Presented at the annual meeting of the A.I.Ch.E., St. Louis, Mo., Dec., 1953.



How to choose a fluid mixer

For best fluid mixing results, choose a mixer that:

- gives you the right balance between fluid flow and fluid shear for the process
- 2. requires the least horsepower to do the job
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You get all three with LIGHTNIN Mixers.

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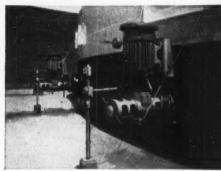
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Weather Forecasts Save Construction Dollars

Du Pont has its own staff of meteorologists on the Savannah River project; most other outfits buy their forecasts outside. Either way, it pays off handsomely.

Security regulations won't allow any figures to be released, but it's a safe bet that Du Pont is saving the taxpayers many thousands of dollars on the cost of the Savannah River H-bomb plant because construction chiefs have a pretty good idea of what tomorrow's weather will be like.

Suppose tomorrow's schedule calls for pouring concrete. If the forecast reads "Heavy rain" the job will be rescheduled. This because the setting up and finishing of concrete are seriously affected by a hard rain. In such a case, personnel are reassigned to work indoors or in above-grade areas and very little motion is lost.

Light, intermittent and scattered showers will also affect concrete pouring and similar jobs. But, knowing the probable starting and ending time of the showers as well as their severity, the construction men can often get a job done on schedule.

Man vs. the Elements—Rain is a tough foe of the construction man. It can halt a job momentarily or put it behind schedule for days. It can spoil materials and equipment and reduce the efficiency of labor.

The other elements are tough, too. Temperature will affect roofing operations and work aloft on scaffolds and power lines. Temperature drops will affect instrumentation, and below-freezing temperatures, if sustained, will hamper all phases of construction. High humidity is another enemychiefly of concrete.

And, of course, extremes of weather exact a heavy toll on the efficiency and safety consciousness of personnel.

• The Romans used to say, "Forewarned is forearmed." It's a motto the construction boss takes to heart where the weather is concerned. Although Du Pont since 1943 has had staff meteorologists advising on new plant locations and problems of air pollution, in recent years the company has expanded these activities to in-

how a dust bowl's manpower problem led to a...

NEW CONCEPT OF PRODUCTION FOR BIGGER PROFITS

No one wanted to work in the "dust bowl" reclaim department of an Eastern plant where graphite and silicon carbide materials are crushed, pulverized, separated and bagged.

Then a Dracco Dust Control System was installed to clear the plant's atmosphere of dust clouds created by crushers, pulverizers, dryers, and other processing units. Result: Dracco meant the end of the manpower procurement problem!

Shortly thereafter, plant management capitalized on the versatility of their Dracco System. They conceived a new technique of integrated production for the recovery of a previously lost valuable by-product. Up to 2,500 pounds of this material is now recovered by the Dracco installation during an eight-hour shift—a profitable dust recovery operation!

Thus, another plant has come to realize increased profits by using peak-performing Dracco equipment.

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clude forecasting weather on construction jobs.

At the Savannah River project the company's engineering department has had a weather forecasting service since 1951. According to W. R. Chalker, daily forecasts are made for the guidance of construction crews, and both short-range (36 hr.) and long-range forecasts are used.

► Commercial Services—Not all construction firms, however, have their own staff of meteorologists. To serve such firms, a number of commercial weather-predicting services have sprung up recently.

Here are some of them:

• Engineering News-Record is now publishing temperature and precipitation probability tables for six-month periods. These are not long-range forecasts, but norms based on U. S. Weather Bureau histories.

Western Union has teamed up with the National Weather Institute, Los Angeles, will flash long- and shortrange forecasts to construction sites.
Irving Krick, meteorological consultant of Denver, also offers both shortand long-range forecasts. Another outfit, Northeast Weather Service, Lexington, Mass., specializes in shortrange forecasts for the New York and New England areas.

Virtually all major construction companies use some sort of weather-forecasting service. Some depend on their own and their client's first-hand knowledge of an area. Lummus, for instance, works this way in the Gulf Coast area.

Fluor uses short-range spot forecasts when the job calls for a substantial amount of concrete pouring or similar weather-touchy jobs. The company also looks to forecasts in areas of severe winters. From such forecasts they determine whether to hold a crew on or close down for the winter.

Foster Wheeler depends on USWB or local agencies for preliminary survey work. After the job has begun, the field supervisor decides whether to use forecasts.

Bechtel uses monthly reports from USWB to determine its production schedules for the big jobs, and short-range forecasts for the one-day jobs.

But whatever the method used, every construction company agrees: It pays to play the percentages where the weather is concerned.



From Bauxite to Aluminum

This new alumina plant of Reynolds Reduction Co., on the north shore of Corpus Christi Bay in south Texas, has been completed and is just getting into production. It can turn out 1,000 tons of alumina daily.

"This installation is unique in several respects," according to Vice President J. Louis Reynolds. It is the first alumina plant in Texas. With the huge San Patricio reduction plant of the parent Reynolds Metals Co. next door, it now gives Texas a completely integrated ore-to-aluminum operation.

The plant, of outdoor design, is built in two sections, each with a capacity of 500 tons of alumina daily. The two sections can be operated jointly or singly.

The new LaQuinta plant is designed especially to process Jamaica bauxite. Ocean-going vessels bring the bauxite up a 6½ mi. channel 32 ft. deep across Corpus Christi Bay to a new pier on the waterfront side of the plant. Here the ore is unloaded and stored for processing.

"From the storage pile," explains R. S. Sherwin, Jr., plant manager at LaQuinta, "bauxite is fed into rod mills where it is wet-ground with caustic soda. The resulting slurry goes into a battery of pressure vessels or digesters where the alumina content of the ore is dissolved by the caustic soda solution. The impurities remain undissolved in the form of red mud.

Next step is to separate this red mud from the mixture, removing the impurities. To reclaim the alumina from the liquor, the solution is sent to a battery of 75 large tanks or precipitators. Here aluminum hydrate is precipitated out of solution during a two-to-three day process."

The largest particles precipitated are separated out, washed, filtered and then put through large rotary calcining kilns operating at 2,000 deg. F. This heat drives off the combined water in the aluminum hydrate crystals, producing pure alumina. The alumina goes to a large storage silo for shipment to the adjoining San Patricio reduction plant, where aluminum metal is produced, or to other reduction plants operated by Reynolds Metals Co.

Small particles precipitated are reprocessed after precipitation until they reach the required size. The liquor is concentrated in large multiple-effect vacuum evaporators and then returned to the rod mills and digesters for reprocessing with more bauxite.

Fuel for boilers and calcining kilns is natural gas with the plant requirements totaling about 20 million cubic feet daily. Fresh water for plant operations amounts to about 2.5 million gallons each day. This water comes from nearby Corpus Christi through a 28-mi. pipeline 24 in. in diameter. It was built by Reynolds.

The Answer to Your Centrifugal Problems can be found in this

Complete line of Sharples Continuous Centrifuges

NOZLJECTOR

Solids are continuously discharged from the disc type bowl of this high efficiency centrifuge which is widely used for separation of two immiscible liquids containing solids, or for the concentration of solids in a liquid phase.





- SEPARATE TWO IMMISCIBLE LIQUIDS
- CLARIFY LIQUIDS
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- **O** CONCENTRATE SOLIDS
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An extremely flexible, completely automatic centrifuge for recovery and dehydration of crystals. Efficiently handles slurries with 15 to 60% solids. Each step of feed, rinsing and drying can be individually controlled.



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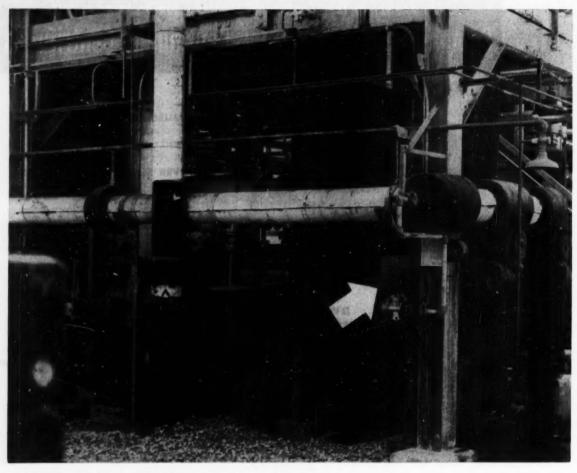
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Automatic control of exidation potential is Mathelin's key to . . .

Sodium Hypochlorite—The Easy Way

Mathieson has a batch and two continuous versions of automatic production based on oxidation potential. One system is going into Matholin's new hydrazine plant.

The new Lake Charles, La., hydrazine plant of the Matholin Corp. will soon be able to boast a completely automatic, continuous system for making sodium hypochlorite, key intermediate in the production of hydrazine by the Raschig process. (Hypochlorite reacts with ammonia to form chloramine which, when treated with more ammonia, is converted to hydrazine.) Contributing from its long experience in manufacture of hypochlorites, Mathieson Chemical Corp., co-owner of

Matholin, bases its control system on the oxidation potential of the hypochlorite solution.

Besides the Lake Charles plant, a continuous system is in operation in a large paper mill, and several batch systems have been installed in textile and commercial bleach plants.

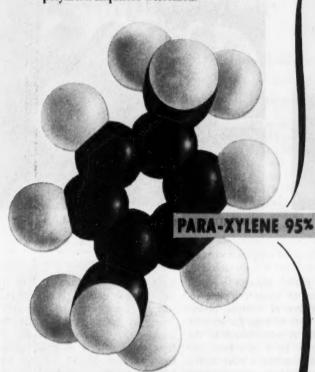
Significant Advantages—In traditional sodium hypochlorite production, chlorine is added to a solution of caustic, Conventional batch systems of bleach manufacture take a good

deal of attention from the operator; automatic control takes none. Also a good deal of plant space is saved with a continuous system because the large chlorination and storage tanks necessary with batch systems are eliminated. Besides these advantages, stability and uniformity of the product are greater and, for pulp and textile applications, a faster bleaching rate is obtained by the use of a bleach liquor containing a minimum of excess caustic. It has been erroncously believed that the stability of bleach liquor increases with the amount of residual caustic soda. Investigational work indicates, however, that there is an optimum excess. For instance, a 16 percent solution of

Oronite PARA-XYLENE 95%

has many potential uses in chemical synthesis

This important chemical may be oxidized to terephthalic acid, a new dibasic acid useful as a chemical intermediate and in the production of polyesters, polyamides, and other high polymers. Inquiries welcomed.

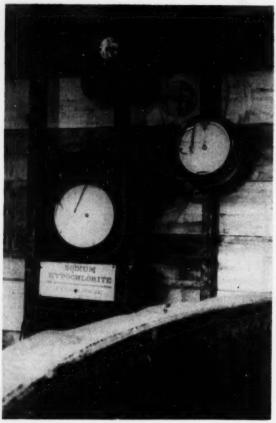




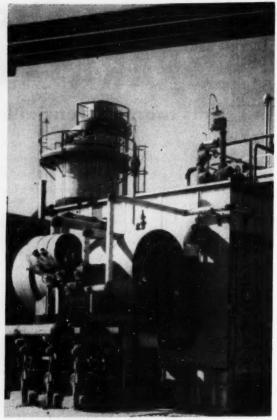
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Chemical Synthesis Possibilities

Process	Product	Usage
Oxidation.	Terephthalic acid.	Formation of polyesters, polyamides, etc.
Oxidation.	Para-toluic acid.	Synthesis of dyes.
Oxidation.	Para-tolualdehyde.	Condensation with polyvinyl alcohol for adhesive resin.
Oxidation.	2, 5-Dimethyl- hydroquinone.	Stabilizing agent,
Oxidation.	Terephthalal- dehyde.	Resins by conden- sation with diamines or sodium acetate.
Oxidation and chlorination.	Tetrachloro- terephthalic acid.	Flameproof textiles.
Oxidation and chlorination.	Tetrachloro-para- toluic acid.	Alkyd resin modifier.
Chlorination.	Tetrachloro-para- xylene.	Dielectric, heat transfer medium.
Chlorination and hydrolysis.	Para-xylyl alcohol.	For xylyl phosphate. Waterproofing agent Cellulose ethers.
Chlorination hot or in ultra violet light.	Para-xylyl chloride.	Lachrymatory.
Dichlorination at boiling or in ultra violet light.	Para-xylylene chloride.	Synthesis.
Chlorination and hydrolysis.	Para-xylylene glycol.	Modification urea - formaldehyde resins
Chlorination in dark with iodine or iron as catalyst.	2-Chloro-para- xylene and 2, 5-Dichloro- para-xylene.	Solvent and/or intermediate.
Chlorsulfonation and reaction with ammonia.	Para-xylene 2-sulfonamide.	Aldehyde resins. Cellulose acetate solvent.
Nitration.	2-Nitro-para- xylene.	Solvent.
Nitration and reduction.	Para-xylidine.	Dyestuffs.
Dinitration.	2, 6-Dinitro-para- xylene.	Dye synthesis.
Sulfonation.	Para-xylene 2-sulfonic acid.	Intermediate.
Sulfonation.	Para-xylene 2, 5- disulfonic acid.	Dyestuffs.
Sulfonation and caustic fusion.	Para-xylenol (2, 5-xylenol).	Making dimethyladipic acid, antiseptics.
Acetylation in presence AICI ₂	2-Para-xylyl- methyl ketone.	Perfume bases. Pharmaceuticals.
Ethylation and dehydrogenation.	Vinyl para- xylene.	Molding compounds. Synthetic rubbers.



BATCH system at New England Chemical Supply Corp.



CONTINUOUS unit at Lake Charles, La., hydrazine plant.

sodium hypochlorite will attain maximum stability with an excess caustic concentration of about 4 grams per liter.

Mathieson has developed three versions of its automatic control system: batch; continuous (single pass); and continuous (circulating). Here's how each works.

► Batch System—This is the simplest type and it may be readily applied to an existing batch unit.

An electrode assembly is immersed in the solution in the chlorination tank. When the oxidation potential reaches the point corresponding to the desired amount of unreacted caustic soda in the solution, the oxidation potential recording controller will send a signal to an on-off valve in the liquid chlorine line, causing it to close.

► Continuous, Single Pass—In this type of operation, caustic soda solution and chlorine are mixed in a suitable device, such as a jet eductor,

and then passed through a small packed tower to insure complete reaction. The flow of chlorine, preferably in the form of a gas for accurate measurement, is proportioned to the flow of caustic by a ratio flow controller which throttles a valve in the chlorine line. Oxidation potential electrodes are placed in the line downstream from the packed tower. The oxidation potential recorder sends a pneumatic signal to the ratio flow controller, resetting the control point and maintaining the potential of the hypochlorite at exactly the desired voltage. Such a control system will compensate rapidly for changes in caustic flow.

It may be desirable to run the sodium hypochlorite solution to a surge tank. This will take care of sudden changes in demand. It is possible to adjust automatically the flow of caustic solution by a level controller in the surge tank.

If the flow of caustic soda is con-

stant or if changes in the flow are infrequent or gradual, it may be possible to eliminate the ratio controller from the system and operate the chlorine flow control valve directly from the oxidation potential recording controller. Liquid chlorine may be used in this case. Individual requirements will determine the practicability of this modification.

► Continuous Circulating—Sodium hypochlorite is circulated from a tank through a mixing eductor back to the tank. Caustic soda solution is added to the circulating liquid immediately after it leaves the tank. The solution then goes through a circulating pump and gaseous or liquid chlorine is added at the eductor. The flow of chlorine is controlled by an oxidation potential recording controller, the electrodes being immersed in the tank. Sodium hypochlorite will overflow from the circulating tank at the rate at which caustic soda solution is added to the system.

ILLCO-WAY ion Change

daily serving the outstanding plants of American industry

Formic acid removed from formaldehyde

Illco-way laboratory develops economical process to remove formic acid from formaldehyde by ionXchange. Formalin solution is colorless, stable.

Formaldehyde usually is manufactured by the catalytic oxidation of methanol. Produced by this method, formaldehyde is susceptible to further oxidation, resulting in formic acid as a contaminant which ranges from 0.03 to 0.05% by weight in 37.5% formalin solution. In some cases this amount of contamination can be tolerated. In

other cases, such as in the production of stable light-color plastics, formate-free formaldehyde is required. One method of attack is simple neutralization of the formalin with sodium hydroxide. This method, however, does not solve the problem, as the sodium formate usually is as objectionable as the formic acid.

The best solution to the problem is actual removal of the formic acid. This is being done economically by ionXchange. Plants using ionXchange treat their entire formaldehyde production and obtain a uniform product containing as little as 0.002% formic acid.

Selection of the proper anion exchange resin was the basic problem confronting technicians in the Illco-Way laboratory. In addition to having high exchange capacity and high found to have high exchange ca-

regeneration efficiency (which re-

sults in low operation cost), the resin had to be stable to the action of this reactive substance. Anion

exchange could not be used if color were imparted to the formalin solution. Many resins were tested in the laboratory. The strongly basic

type anion exchangers gave the best formic acid removal; but unless

careful control were used, these resins caused polymerization of the

formaldehyde to paraformaldehyde.

The weak-base exchangers allowed

a certain amount of formic acid

leakage, but one weak-base type was

pacity at low regenerant levels. The exchanger did not "throw color." Cycling tests showed good stability to formaldehyde. Resin amortization was low, so the over-all economy of the process was attractive.

Laboratory and pilot-plant information of this nature has enabled Illco-Way to design, fabricate, and install full-scale plants for the deacidification of formaldehyde. Investigation of chemical solutions requiring purification is carried on in the completely equipped ionX-change laboratory shown above. Illco-Way technicians work with individuals interested in exploring the possibilities of ionXchange. Research methods and development facilities are available to industry.

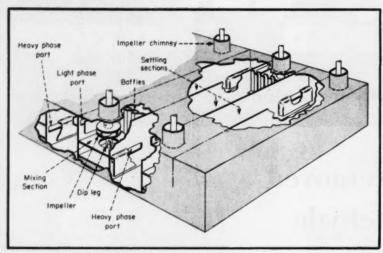


"PACKAGE" DE-IONIZER IN PHARMACEUTICAL PLANT

Solids-free water used in the preparation of pharmaceuticals is produced by the Illco-Way De-ionizer above (center). It is installed in the pharmaceutical plant of A. H. Robins Company, Inc., Richmond, Va., and is typical of Illco-Way's standard (package-type) units. Completely fabricated and tested in the Illco-Way factory, the units are shipped assembled.



ionXchange



COMPACTNESS and flexibility are important features.

New Extractor Uses Pump-Mixer

The use of a mixer and pump combination results in a compact, efficient mixer-settler liquid-liquid extractor. It is well suited for pilot-plant work.

Unorthodox problems require ingenious answers, especially when working with radioactive materials. This is very much in evidence in a recently disclosed design of a multistage liquid-liquid extractor.

General Electric engineers, in their work for the Atomic Energy Commission, needed an extractor for processing radioactive solutions. To keep heavy shielding to a minimum, it was essential that the unit be compact. The answer was the "pump-mix" mixer-settler; a box-like unit made up of a number of extraction stages arranged in a herizontal pattern.

► Evolution of Design—Deciding on a mixer-settler type of extractor gave GE many designs to choose from.

In the elementary form of mixersettler the mixer is a vessel with an agitator for mixing solvent and feed. The settler is another vessel designed to minimize turbulence and allow for the separation of the liquid phases. The mixed phases are transferred to the settler either by a pump or by gravity feed. When you want a number of stages, this arrangement is anything but compact.

compactness, mixer-settler stages can be stacked vertically in the form of a column. Typical of this design is the York-Scheibel column, where agitated mixing sections are separated by packed settling sections. The mixing impellers are all on a common shaft which enters at the top of the column. Column extractors were ruled out by GE because of the heavy foundation that would be required to support a vertical column of lead bricks used as the shielding material. ► Horizontal Scheme—What finally evolved, under the direction of B. V. Coplan, can best be visualized as a horizontal York-Scheibel extractorbut there are important differences in the two designs. Described at a recent mixing symposium of the AlChE*, the extractor has alternate mixing and settling sections. These box-shaped sections are separated from each other by baffles.

Unlike the Scheibel column, however, each mixing section has its own shaft and impeller. Also, the impellers do more than just mix the liquid phases—they provide the pumping action to keep the liquids flowing through the unit.

The result is an extractor ideally suited—not just for working with radioactive materials—but for general pilot-plant work. Here's why:

- The unit is compact. The dualpurpose impeller in each stage eliminates the large stages or mechanical tilting required in many gravity flow extractors. Where there is a problem of low head room, the horizontal design has a definite advantage over column extractors.
- Interface level is self-controlling.
 The pumping action of the impellers provides built-in automatic level control.
 This eliminates the adjustable weirs, valves or other devices required on gravity flow extractors.
- Flexibility is inherent in the design. Mixing intensity can be varied by simply changing the impeller speed or size.
- Samples can easily be taken; intensive mixing gives high stage efficiency; maintenance is easy; these are all important additional features.
- ► Impeller—This is actually a closed centrifugal pump impeller with four vanes. It is driven by a shaft which enters through the top of the stage. A hollow dip-leg is connected to the impeller along the shaft axis.

As the shaft rotates, heavy-phase liquid is drawn up the dip-leg and discharged through holes in the impeller, just as in a pump.

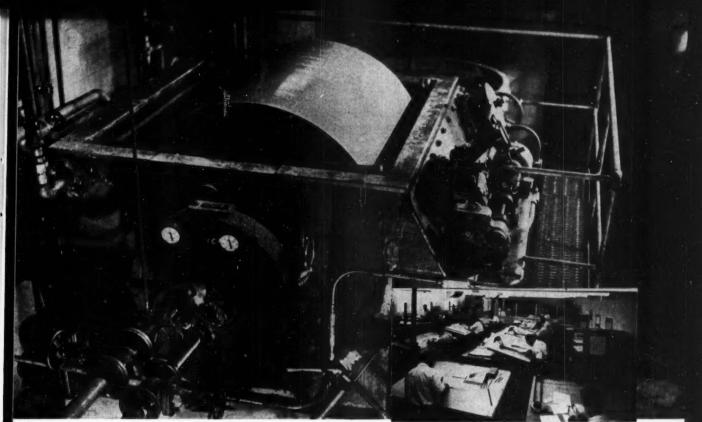
Light-phase material enters near the top of the section. The impeller, now acting as a mixer, brings the light and heavy phases together in the turbulent area surrounding the impeller and intimately disperses the phases.

To increase mixing intensity, blades can be attached to the top disk. Care has to be taken, however, in using these blades. General Electric engineers found that the blades create considerable additional turbulence. They should only be used in systems that can stand vigorous mixing without forming emulsions. When an emulsion is formed, the capacity of the unit is greatly reduced.

After mixing, the phases are "pumped" to the settling section. This is set off with baffles from the mixing section. The phases separate here and continue on through the extractor.

(Turn page)

^{*}San Francisco meeting, Sept. 13-16, 1953.



Skill and Ingenuity at Work for You

Your Eimco filter is a product of skill and ingenuity wrought from more than half a century of service to the process industries.

As a matter of fact, think about it — you wouldn't want it any other way. When you've worked out a process that requires the culture or slurry to be handled just so to produce your laboratory results, you can't afford to recommend anything but the finest equipment all the way through the plant.

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Each Eimco filter for the special process industries receives individual attention in engineering (above) and inspection (below).



Skilled mechanics with a field knowledge of filtration problems machine and assemble your specialized Elmco filter.



The finished product is completely assembled in the shop even if dismantling is necessary for shipment. An Eimco mass will supervise its installation.





▶ Gravity Flow Disadvantages—One big disadvantage of many gravity flow mixer-extractors is tied in with the problem of getting a hydraulic head. As the number of stages is increased in such equipment, the unit has to be tilted, or stages made sufficiently deep, in order to get flow. Tilting is mechanically inconvenient. Deep stages mean large hold-ups.

The GE extractor, by using the pumping action of the impeller, eliminates tilting and deep stages.

Also, in many gravity-flow extractors, instrumentation is needed to control the interface level in each stage. This may take the form of valves or adjustable weirs. The same pumping action, tied in with the dip-leg, results in automatic level control in the GE design. Here is how it works;

1. The impeller is designed so that its capacity is greater than the heavy phase flow rate.

2. Since the capacity is greater, the

interface will fall below the tip of the dip-leg.

3. When this happens, the impeller simply recycles the mixed phase from the upper portion of the mixing section.

4. This recycling takes place until the interface again builds up. Thus the interface will be alternating between the dip-leg and just below the dip-leg—continually making and breaking contact.

5. By adjusting the height of the leg, any required level can be controlled. Simple? Yes—but ingenious. ▶ Baffles—These are used to advantage throughout the extractor.

A baffle separates the turbulent zone of the mixing section from the settling section.

Baffles on the light phase inlet to a mixing section prevents flow back to a previous settling section.

A baffle on the heavy phase inlet serves to eliminate stagnant layers.

GE's unit, in use at the Knolls Atomic Power Laboratory in Schenectady, has stages 3 in. wide, 5 in. high and 11 in. long. The mixing section is 3 by 3 in. and 2½ in. high. Impeller diameter is 1½ in. and the dip-legs are 2 in. long and 7/16 in. I.D. Capacity is 0.2 to 0.5 gpm. total flow of both phases. Shaft speeds of 300 to 600 rpm, have been used.

Here are some typical data from an extraction of acetic acid from water with methyl isobutyl ketone:

Acetic acid in the aqueous stream, moles/liter	1.04
Acetic acid in MIBK stream, moles/liter	0.00
MIBK feed rate, cc./min	50.9
Number of actual stages Number of theoretical stages re-	10
quired	10

General Electric's people are sold on their new extractor. They have every reason to be. It should prove a useful and efficient tool in research and development work.



Polyethylene From Oil Gas

Twenty million pounds of A-C Polyethylene—that's the estimated annual production of the new Niagara River Petrochemical Plant (Tonawanda, N. Y.) of Allied's Semet-Solvay Petrochemical Division.

This is the first plant for commercial production of ethylene from any petroleum or natural gas fraction heavier than air. Credit for design and construction of the ethylene unit goes to The Lummus Co. The adjoining polymer plant (designed by Semet-Solvay's Engineering Division) processes the ethylene into polyethylene.

Allied claims A-C Polyethylene will get its biggest play from:

• Paper Processessors—who can, because of narrow melting range and viscosity characteristics, incorporate the polymer into petroleum waxes at lower formulation costs.

 Producers of Emulsion Polishes who can count on lower and more stable prices than those of imported vegetable waxes.

 Other Manufacturers — Rubber, paint, textiles, printing inks, electrical insulations—who need non-tacky, non toxic polymers with high chemical and abrasive resistant qualities.

Convention Calendar-

Drug, Chemical & Allied Trades Section, New York Board of Trade, annual dinner, Waldorf-Astoria Hotel, New York, March 4.

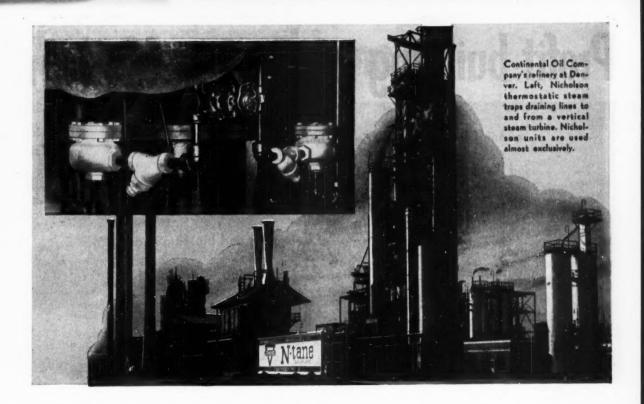
American Institute of Chemical Engineers, national meeting, Statler Hotel, Washington, D. C., March 8-10.

Commercial Chemical Development Association, annual open meeting, Statler Hotel, New York, March 17-18.

Industrial Research Institute, award dinner, San Francisco, April 22.

Association of Consulting Chemists & Chemical Engineers, Belmont Plaza Hotel, New York, April 27.

For More WHAT'S HAPPENING Page 386



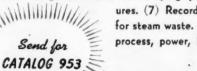
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for CONOCO Refinery

his Continental Oil Company refinery has adopted Nicholson steam

traps because they proved most effective generally in improving heat transfer. This is an advantage which, we believe, is important to plant men in every industry. A recent survey showed these Nicholson features to be the reasons why plants with standardization-for-economy programs are increasingly adopting Nicholson traps: (1) Two to six times average drainage capacity. (2) Operate at lower temperature differential. (3) No air binding. (4) Freeze-proof. (5) Only one moving part. (6) No change of valves for varying press-

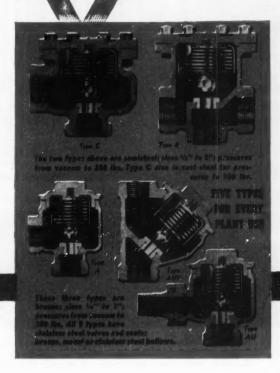
ures. (7) Record low for steam waste. For process, power, heat.



NICHOLSON

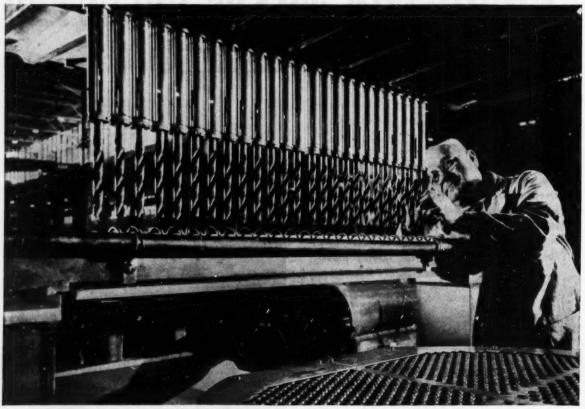
TRAPS · VALVES · FLOATS 206 OREGON ST., WILKES-BARRE, PA.

Sales and Engineering Offices in 58 Principal Cities



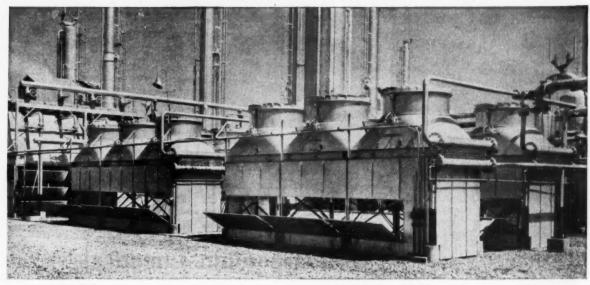
Profit-building answers to Modern

...examples of the wide variety of heavy-metal equipment designed and built by Alco to meet today's demands in petroleum and petrochemical processing . . . results of Alco Experience . . . gained through many years of designing and building heavy-metal equipment for refining and processing companies the world over . . and Alco Facilities . . . capable of handling economically an extremely wide range of metal-fabricating operations . . . of meeting strictest customer specifications.

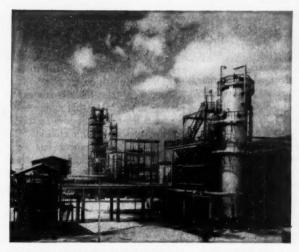


NEW 25 SPINDLE DRILLING MACHINE at Alco's Dunkirk plant typifies the special equipment that enables Alco to produce profit-building answers to almost any processing problem. Spindles take drills up to 1-in. in diameter, pierce steel tube-sheets and support plates up to 4-in. thick at optimum speed.

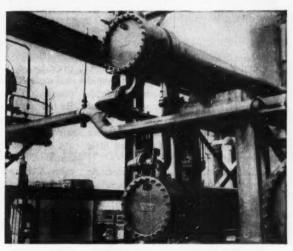
Processing problems



AIRCOOLERS solve the problem of efficient, economical heat dissipation in arid regions. Here, at a Wyoming gas plant, each of two batteries of two specially designed Alco units cools 125,500 lb per hr of lean solution (175 psi, 200 F) at a rate of 4,920,000 Btu per hr—a total of 251,000 lb and 9,840,000 Btu per hr.



AMONG THE MANY ALCO UNITS now in service at Shell Caribbean Petroleum Company's new refinery at Cardon, Venezuela, are the pressed oil flashtower and pressed oil stripper. With a daily capacity of 170,000 bbl, Cardon is the largest refinery on the South American continent.



SPECIAL MONEL CONDENSERS, fabricated by Alco for Atlantic Refining Company's Philadelphia plant, boost efficiency in the manufacture of "Ultrawet" synthetic detergent. Monel construction guards against corrosion by the dilute hydrochloric acid produced in the vapors.

As the first step toward profit-building answers to your own processing problems, contact your nearest Alco Products Sales Representative today. Offices in Dunkirk, New York, Chicago, Los Angeles, Kansas City, Houston, Tulsa, and Beaumont.

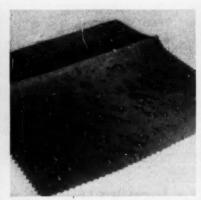
ALCO

ALCO PRODUCTS DIVISION

AMERICAN LOCOMOTIVE COMPANY . DUNKIRK, N. Y.

Product News Edited by Edward T. Thompson







MAGNESIUM CASTINGS, textile water repellants and refractories all use zirconium products in tonnage quantities. Find out . . .

Where You Can Use Zirconium Chemicals

Almost unnoticed, the market for zirconium chemicals has skyrocketed since 1943. Here's a quick look at today's uses and at what's going to be big tomorrow.

The flurry of excitement surrounding the urgent need for pure zirconium metal by the AEC and by private industry has nearly obscured the rapid growth of the zirconium chemicals industry. A vague impression that zirconium is extremely scarce has led many engineers to conclude that, for the present, at least, it can have little industrial importance.

But zirconium is not at all rare. As a matter of fact, it's about as abundant in the earth's crust as carbon. And many important industrial chemicals are being made from zirconium ores. Without dwelling on the complex and intriguing chemistry of these products, here's a brief roundup on what's been happening in the field.

► Markets Are Big—Due largely to the research efforts of the companies that produce zirconium chemicals, particularly the Titanium Alloy Mfg. Div. of National Lead, zirconium compounds have experienced a fast market growth. In 1943, about 10 thousand tons were sold. Today, the annual sales rate runs well over 40 thousand tons for all applications.

Practically all zirconium compounds are derived from zircon, ZrSiO₄, an extremely inert substance found in

beach sands. The only other important source is baddeleyite, a zirconium oxide found only in Brazil.

Two methods are used to decompose zircon into other usable products. By heating to 900-1,000 deg. C. with soda, lime, potash or salts, the mineral is converted to a silicate and a zirconate, e. g., Na₂ZrO₂, which can be separated. This process is expensive, however. A cheaper, simpler way is to heat zircon with carbon in an electric arc furnace, producing zirconium carbide.

The carbide, an extremely hard, refractory compound, melts at about 3,500 deg. C. Its major use is as a source of still other zirconium compounds. When burned in air, a relatively pure zirconium dioxide is formed; when burned in a halogen, the tetrahalide is produced. These compounds will be discussed later.*

Catalysts for the Future—One of the most recent developments in zirconium chemistry, and the one that's likely to generate the most interest in the near future, is in the field of catalysis. A literature survey reveals that many zirconium compounds, par-

ticularly ZrO₂, but also many salts, have shown definite value as catalysts or catalyst supports in a wide variety of reactions. These vary from ammonia synthesis via nitrogen and hydrogen to esterification of ethyl alcohol with HC1, from hydrocarbon cracking to oxidation of naphthalene to phthalic anhydride.

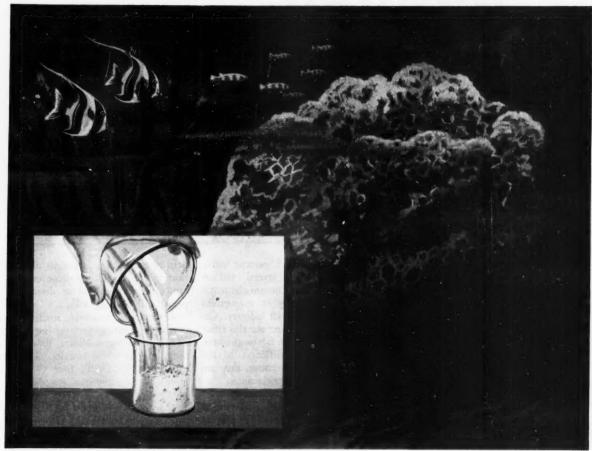
Zirconium tetrachloride, for example, has shown better, but more erratic, catalytic results in Friedel-Crafts reactions than aluminum chloride. Although this development has been known for several years, it's received very little publicity. Zirconium halides are also used commercially in various vapor phase esterifications.

Stop That Itch—Another important recent development is the use of hydrous zirconium dioxide, both alone and carbonated, to cure dermatitis resulting from poison ivy. The function here is to form chelated groups with the hydroxyl groups in urushiol, the "poison" in poison ivy.

Six drug companies have been licensed in the poison ivy application and total sales in 1953 ran about 300,000 tubes. This figure is expected to jump considerably this year.

Zirconium compounds, including hydrous zirconia, are also used in personal deodorants. One of the biggest deodorant makers has just finished extensive field tests of a product containing a zirconium lactate and ex-

^{*}Aside from its importance as a source of zirconium chemicals, ZrC has been proposed for use in abrasives, refractories, cutting tools and detonating powders.



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The unique structure of the microscopic Celite particles offers many other advantages. These particles are spiny and irregularly shaped, strong and rigid ... as a result they do not pack together.

Thus Celite powders have great bulk per unit weight . . . making them valuable for fluffing up dry powders such as household cleansers . . . and extending pigments in paint and paper.

Celite's physical structure itself is also utilized in many different ways . . . as the outstanding flatting agent for paints ... as a mild non-scratching abrasive for fine polishes . . . and to improve surface appearance in plastics. And it is also the reason why Celite can add strength, toughness, stiffness, durability and many other desirable characteristics to your product.

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formance or lower production costs, investigate industry's most versatile mineral filler. One of the J-M Celite Engineers will gladly discuss your problem. These men are backed by complete technical services and the Johns-Manville Research Center, largest laboratory of its

kind in the world. For further information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ont.



*Celite is Johns-Manville's registered Trade Mark for its diatomaceous silica products.



Johns-Manville CELITE INDUSTRY'S MOST VERSATILE MINERAL FILLER

pects to go into large-scale manufacture this year.

▶ Textiles Use Them—Of even more direct interest to chemical engineers is the use of zirconium chemicals by the textile industry. Combinations of zirconium acetate and wax emulsions form effective water repellents for textiles, as do combinations of ammonium zirconyl carbonate, ammonium oleate and wax emulsions. And several zirconium compounds are precipitants for acid and basic dyes. These are used for the fixation of dye-stuffs to textiles.

The importance of these chemicals in textile applications lies in their peculiar capacity to form both compounds and complexes with textile fibers and materials used in finishing processes. Four classes of zirconium chemicals are available for this field:

• Zirconyl salts, typified by zirconium oxychloride. This is the cheapest class and is extremely acid. Acidity can be decreased, however, by adding soda ash to form such compounds as basic zirconyl chloride—Zt₂O₅Cl₅—or by buffering with alkali acetates.

• Zirconylic acids. The best known of these are zirconium sulfate and zirconium acetate. The first is a very strong acid and is of particular interest because the zirconium contained is almost entirely tied up in an anionic complex. The latter is a weak acid and is used extensively as a fixative for water repellent films on fabrics.

• Alkaline salts of zirconium. Ammonium zirconyl carbonate, one of the few zirconium compounds stable in alkaline systems, is typical. It is used in combination with other textile finishing operations, usually alkaline, to add water repellence in one step.

• Complex salts of zirconium. Sodium salts of zirconium lactate and glycolate are examples. Sodium zirconium sulfate, ammonium zirconium sulfate and various zirconium salts are also included in this category.

Sales of zirconium chemicals for textile applications more than doubled from 1947 to 1949. Since then they have continued to rise sharply.

Metal Refining—In combination with alkali chlorides, zirconium tetrachloride and tetrafluoride are widely used as additives to molten magnesium metal. The zirconium compound is reduced to give the element, a small amount of which dissolves in the magnesium and serves to refine the grains and up casting strengths.

A capsulated listing of this month's newsworthy products.

It's New	It's Good for	See	Page	
Ziriconium Chemicals Allethrin Derivatives Adhesives Paraformaldehyde Plastic Rope	Catalysts, curing dermatitis and dye fixin Synthesis of pharmaceuticals and insection Plywood and furniture industries	des.		.142
Coolant Odorless Paint Aid Bonding Resin Nickel-Cadmium Battery Mold Release Liquid	Machine tool operations	0 yea	 Lrs	.146 .146
Glycol Ethers Chelating Agent Wetting Agent Thiophenol Resin Cement	Use as high-boiling solvents and rewetting Controlling trace amounts of trivalent iron Preparing many emulsions and dispersions Dyes, polysulfone resins and oil additives. Complete resistance to acids, alkalis and s			.148 .148 .148
Aluminum Fluoride Coatings for Plastics Tallow-Based Detergent Maleic Anhydride	Laboratory hydrocarbon cracking; extrem: Pigmenting or dyeing			.148

Although only 0.4 percent zirconium is required, several million pounds a year of zirconium chemicals are used, particularly in magnesium destined for the aircraft industry. Cerium, thorium and zinc are also effective strength-boosters for magnesium, but they impart brittleness to the finished castings. Therefore, they are often combined with zirconium.

More significant to the metals industry on a volume basis is the use of zirconium dioxide—over 95 percent pure—as an opacifier in antimony and zirconia opacified sheet steel enamels. It is also used extensively in the fabrication of refractory ware and in glazes of all types.

Zircon sands are important to metal manufacturers, too. Biggest use is in foundries for cores, molds and facings to produce smooth castings and to reduce cleaning costs by eliminating the adherence of sand to the castings. It has a slight chilling effect on the metal because of its high heat conductivity and is virtually nonreactive with most metals and alloys. This market amounts to several thousand tons of zirconium compounds a year.

Drganics—Since there is no known compound with a carbon-to-zirconium bond, there is no organo-zirconium chemistry in the strictest sense. But many compounds are known in which zirconium is bound to carbon through oxygen and nitrogen. Much of the current research work on zirconium chemistry is along these lines.

For example, zirconium oxychloride forms soluble compounds with the lower molecular weight a-hydroxy acids, but insoluble soaps with higher ones. Some zirconium soaps can be dissolved in hydrocarbon oils and have

been proposed as components of lubricating greases. Other zirconium organics are being used as driers for paints and printing inks.

Zirconium tetracholride reacts with oxygen- and nitrogen-containing compounds, forming addition products, such as esters and amides. Under proper conditions, all four chlorine atoms can be replaced by alkoxide groups to yield "ortho esters." These have resin-like properties and have attracted attention as useful components of paints and lacquers.

When hydrous zirconia is treated with certain salts or their acids—such as citrates, tartrates and benzoates—zirconeates are formed. Mixing these with solutions of basic dyes produces intensely colored solids which are suitable for certain pigment uses.

Soluble compounds of zirconium, particularly the oxychloride, are precipitants for practically all classes of acid and basic dyes. The resulting pigments are characterized by high resistance to water bleed.

Deter Significant Uses—Rounding out the use pattern of zirconium chemicals are a number of important industrial applications. Barium, calcium, magnesium and strontium zirconates are blended with titanate dielectrics to obtain ceramic bodies with special electrical properties for capacitors. Hydrous zirconia is a powerful adsorbent of many organic and inorganic substances. It can be used to remove metallic and nonmetallic contaminants, color contaminants and odors from various commercial liquids.

Zirconium sulfate and several of its derivatives have been found particularly useful in the tanning of white leather. Basic zirconium sulfates,



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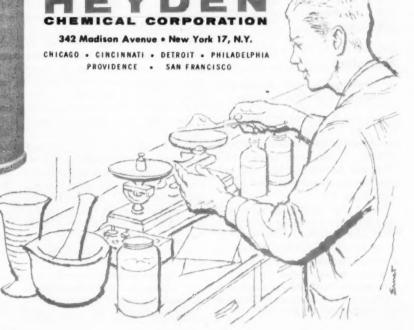
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SALICYLAMIDE



PRODUCT NEWS . . .

which are insoluble in moderately strong acids, can be used to separate zirconium from other metals, particularly iron. Zirconium acetate is useful as a catalyst for certain types of methyl

From this multitude of uses, many of which are not even mentioned here, it seems reasonable to expect that future market growth of zirconium chemicals may dwarf even the rapid rise since World War II. The skyrocket should keep right on climbing, although perhaps not so unnoticed as in the past.

Chemical Intermediates

Derivatives of allethrin have many uses in specialty products.

The availability of five new chemical intermediates from the production of allethrin has been revealed by U.S.I. These chemicals are believed to have possible uses in the synthesis of pharmaceuticals, perfumes, fungicides, insecticides and other fine chemicals.

The five intermediates have been identified as allyl acetone; 2,5-dimethyl-hexane-2,5-diol; 2,5-dimethyl-2,4-hexadiene; ethyl-a-allylaceto-acetate; and ethyl diazoacetate derivatives. These are the first of several chemicals the company expects to derive from the industrial synthesis of allethrin at its new Baltimore plant, the first integrated allethrin plant in the world. -U.S. Industrial Chemicals Co., New York 5, N. Y.

Adhesives

Developed primarily for the plywood and furniture industries.

Two new liquid urea resin adhesives with high rates of reactivity in hot press, wood-gluing operations are now available. Tradenamed Lauxite UF-101A and Lauxite UF-112, the two glues contain 60 and 65 percent solids, respectively.

In hot press operations, cycles have been obtained which are faster than those ever attained before, resulting in an average production increase of about 25 percent. Lauxite ureas are especially recommended for use in urea-melamine resin adhesive mixtures. -Plastics Div., Monsanto Chemical Co., Springfield, Mass.



LARGE-SCALE PRODUCTION by Celanese at Bishop, Tex., plus . . .



COMPLETE TECHNICAL SERVICE have been important contributors to . . .

Paraform's Rise to Fame

When Celanese Chemical Div. announced a 30 percent price cut for paraformaldehyde back in 1949, competitors and consumers alike pricked up their ears. Subsequent price reductions aided by intensive market development have pushed sales to new highs every year and the feeling within the company is that the surface has barely been scratched.

In the beginning, Celanese had three goals in mind: to capture as much of the existing 3 million lb. market as possible; to expand existing uses; and to open new markets in competition with formalin-37 percent formaldehyde in water. Just how well these objectives were attained can be judged from the fact that over 10 million pounds of flake and powdered paraform were sold last year, plus more than 10 million pounds of Formcelsparaformaldehyde dissolved in alcohols-which had no sales at all in 1950. ► More for Your Money-Celanese

paraform is a 91 percent grade of crystalized formaldehyde-about 10 polyoxymethylene glycol groups. The remaining 9 percent is free and combined water. Currently the flakes are delivered in carload lots at 12c./lb., as compared to about 11c./lb. for formalin on a 100 percent formaldehyde Paraform powder sells at 15½c./lb. But price doesn't tell the whole story.

In the production of phenolic, urea and melamine resins-undoubtably the product's biggest potential market -paraformaldehyde has some rather

important advantages which often more than offset any price difference. Its higher reactivity, resulting from low molecular weight, means that resin yields are generally higher. When making substituted phenolics, for instance, up to 17 percent less formaldehyde is needed to get the same resin, if you use paraform instead of formalin. For a straight phenolic, about 7 percent less is required.

The reason for this saving is that phenol is only partially soluble in the water that accompanies formalin, but paraform dissolves readily in phenol. Substituted phenols are even less water soluble and usually require a pressure system when processed with formalin. This isn't necessary with paraform.

In general, paraform has these advantages over formalin in urea and phenolic resin manufacture in addition to higher yields:

• Because the necessity of shipping and processing large amounts of water has been eliminated, shipping charges are lower, no dehydration is needed and you can charge one-third more to your kettles.

· Cycle times are cut nearly in half. A resin that normally requires 5-6 hours can be made in 23-3 hours. Thus you get more efficient utilization of your kettles (3 batches per day with paraform, as compared to 1 or 2 with formalin).

► And Not Only Resins-Next to phenolic and urea resins, paraform has found its single biggest outlet in the

These Dollars Are Gone Forever!



Many, many companies in the petro-chemical field sign a blank check every year payable to The Korrosion Kids. And some of these companies never know what the corrosion of tube in heat exchangers and condensers is costing them.

But—here's a tip! You can save much of this money if you always use the *right* copper-base alloy condenser tube for the corrosive conditions you encounter. That way, you can be sure that your installation will stand up on the job.

Wolverine produces prime surface condenser tube in the following alloys: copper; Admiralty

Visit Wolverine Tube Division at Booth 20-21, 10th Annual National Association of Corrosion Engineers, Kansas City, Mo., March 15-19. and inhibited Admiralty; cupro-nickle 70-30, 80-20, 90-10; aluminum brass; red brass 85%; and Muntz metal.

To help you pick the right alloy and to answer your questions relative to tubing, Wolverine has set up a Field Engineering Service. Call on them—any time. And to help you even more, Wolverine has just published a handy corrosion chart which tells you at a glance the action of various substances on copper and copper-base alloy tubing. You can have one—and a copy of our new condenser tube book—if you write today. No obligation, of course! Wolverine Tube Division of Calumet & Hecla, Inc., 1443 Central Ave., Detroit 9, Michigan.



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oil fields. Its function here is to preserve pregelatinized starch used for oil well drilling muds. The combination reduces filter loss of drilling muds at a fraction of the cost of carboxymethyl cellulose.

In 1949 the market for paraform in this use was about \(\frac{1}{2}\) million lb. Now, as a result of the intensive Celanese market development program, the market is over 2 million lb. a year, with the end not yet in sight.

For the many chemical reactions that need dry formaldehyde at a price competitive with formalin, paraformaldehyde definitely rates consideration. Chloromethylation processes, for example, use catalysts that are extremely sensitive to water. Yet several of them are now able to use paraform and even more will be able to in the near future because of the development by a major oil company of a catalyst that can tolerate larger amounts of water.

Another field that may well hold a big potential for paraform is bactericides for soaps. Testing programs are now well underway to determine the feasibility of using paraform to make nonyl or dodecyl benzyl pyridinium chloride. If successful, these products would replace cetyl pyridinium chloride which is now widely used by soap manufacturers.

The versatility of paraformaldehyde

as an organic chemical intermediate has had a lot to do with its acceptance by industry. The low cost form supplied by Celanese was instrumental in the development of cheaper vitamin A. Cork binders, ion exchange resins, demulsifiers, pharmaceuticals, synthetic rubber, terpene derivatives and vinyl resin plasticizers are a few of the many other types of products now being made with paraform.

> How It Grew—The development of

▶ How It Grew—The development of the paraform market by Celanese went through four distinct stages: market investigation, experimental development, market development and transition to sales. The total elapsed time was about four years and market growth was rapid.

In 1948, preliminary market investigation pointed to a maximum potential for paraformaldehyde of some thirty times the existing 3 million lb. market if the price could be brought down to compete with that of formalin—about 12c./lb.

Starting with its newly-developed continuous process, Celanese went right ahead with a 3½ million lb. semiworks unit designed to produce paraform with rigidly controlled molecular weight at 14½c./lb. Repeated contact with resin producers opened up several new accounts and led to the establishment of a complete resin laboratory to evaluate paraform and to

compare it in all resin applications with formalin.

The results of this application work showed that paraformaldehyde could indeed effect savings over formalin in many resin formulations. In January 1950, Celanese had 12 purchasing accounts. By November of that year, 100 accounts had been developed, 80 of which had never used paraformaldehyde before. At the present time, the company has over 150 purchasers of paraform.

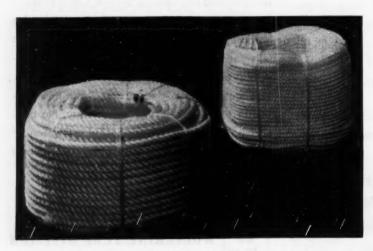
The early experimental work also showed that many products, such as alcoholated urea, phenolic laminating varnish and urea textile coatings could best use paraform already dissolved in alcohol. This led to the development of Formcels and the market potential is big. For example, the present market for butyrated urea and melamine resins alone is approximately 20 million pounds a year on a dry solids basis. If Formcels could capture the entire field, it would mean annual sales of 20-25 million pounds.

By February 1951, sales of paraform exceeded production capacity by 30 percent and plans were formulated to build a commercial plant. Economic studies showed that flake paraform could be produced commercially at 12c. per lb. and that the product at this price could secure a significant part of the formaldehyde market from formalin.

Paraformaldehyde was turned over by the Product Development Dept. to the Sales Dept. in September 1952 and the resin laboratory now functions as a service to sales. Formcels, which had limited acceptance at first, are still the object of concentrated market development, but it's expected that these products, too, will be turned over to the sales force in the near future.

The ultimate potential for paraformaldhyde is considerably less than the total formalin market, which was over 1 billion pounds last year. Over 60 percent of the formalin made is consumed internally by its producers and of the rest, several end uses, such as low solids urea resins, need the water included with formalin. In addition, most users of formaldehyde are set up to handle liquids. To convert to paraform would necessitate capital expenditures for materials handling equipment.

But despite these limitations, the uses for low cost paraformaldehyde,



PLASTIC ROPE RESISTS MOST ACIDS AND ALKALIS

A new process that converts polyethylene and Mylar plastic films into rope promises operating economies for the chemical process industries. Having all the behavior characteristics of natural fiber ropes, the new products are totally unaffected by most acids and alkalis, specifically including sulfuric acid. Standard coil lengths are made in diameters up to 1 im., with larger diameters produced for special requirements.—U. S. Plastic Rope, Inc., Redwood City 7, Calif.

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PRODUCT NEWS . . .

particularly in resins, are varied enough and big enough to assure this product's continuing growth.

COOLANT

For machine tool operation; it's water soluble and oil free.

Dypral, a new general-purpose coolant, is said to permit greatly increased speeds and feeds in machine tool operations on both metals and plastics. Although the coolant is completely water soluble and oil free, it meets most of the cooling requirements for cutting, sawing and grinding and will do work which formerly required several coolants.

The solution is odorless, does not smoke nor become rancid during use and does not lose efficiency through cutting or frictional heat. Work pieces and tools remain cool and can be handled readily with bare hands, assuring high dimensional accuracy.

The fresh water ratio is determined by the speed of the operation, ranging from one part Dypral to ten parts water when tapping, drilling or threading to one part Dypral in 50 parts water for general grinding. Parts which have been machined using this coolant are clean when they come from the machine and need not be put through a degreasing operation.—Dynamic Industrial Products, Inc., Danbury, Conn.

Odorless Paint Aid

Helps keep alkyd resins stable in odorless paint solvents.

One of the biggest difficulties in formulating odorless oil base paints has been to obtain sufficient solubility of the alkyd resins in odorless solvents without suffering loss in covering and hiding power and without danger of instability. Now it appears that the use of a special grade of glyceryl monooleate (S1096R) may solve this problem.

Odorless solvents with glyceryl monooleate keep the alkyds in solution within reasonable viscosities and with freedom from stability worries. The amount needed varies from about 5 to 15 percent by weight on the vehicle solids.

There is said to be no sacrifice in holdout, adhesion, durability or brushability. And costs need not be increased. Since glyceryl monooleate is non-volatile and becomes an integral part of the vehicle solids, you can eliminate an equal amount of alkyd resin.—Glyco Products Co., Inc., Brooklyn 1, N. Y.



Nickel-Cadmium Battery

Will last at least five times as long as lead batteries, even at extremely low temperatures.

After four years of actual production for the U.S. armed forces, Sonotone's revolutionary nickel-cadmium battery has been released for civilian use. Its two biggest advantages are long life and ability to operate over a very wide range of temperatures.

Tests indicate a life expectancy of at least 10 years and in some cases it can be used up to 20 years. The cells can be left indefinitely in a state of complete discharge and cannot be damaged by excesively high rates of discharge or charge, overcharge or even reverse charging.

The new battery can be used from -65 deg. F. to 165 deg. F. It uses potassium hydroxide, which freezes at about -75 deg. F., as the electrolyte instead of acid. And unlike other batteries, the unit can be charged at 40 deg. F. below zero, accepting as much charge at this temperature as it does at room temperature. Also, it can be used in any position, even upside down, and it's invulnerable to shock and vibration.

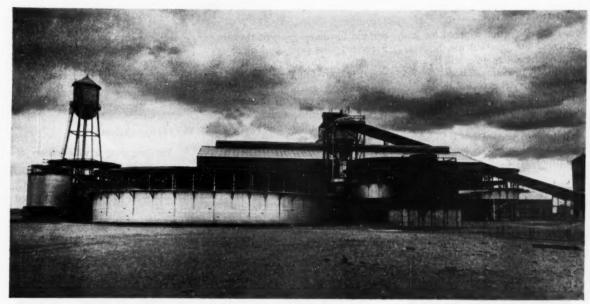
These unique characteristics are due to the sintered construction of the battery's porous plates. The active forms of nickel and cadmium are deposited in microscopic pores electrochemically, providing hundreds of square feet of working area. This also gives smooth surfaces which can be packed closely together with only thin separators.

The result of this construction is that the new batteries need take only



SILICONE-GLASS LAMINATES MADE WITH NEW RESIN

Low pressure silicone-glass laminates with initial strength and stiffness values approaching those of the organics are being produced with a new bonding resin, Dow Corning 2106. Typical 1-in. samples (30 percent resin, heat cleaned 181 cloth) show flexural strengths in the range of 50,000 psi. at room temperatures even before curing. High temperature strength is obtained after relatively short cures, the optimum being about 80 hours at 480 deg. F. Flex strength of 10,000 psi. at 500 deg. F. is reached in only 6 hours, indicating that in many applications, laminates can be cured in service.—Dow Corning Corp., Midland, Mich.



Overall view of the plant with a 120' dia. Dorr Thickener in the left foreground handling flotation tailings. A 40' dia. Dorr effluent Thickener and 40' dia. Dorr Hydroseparator are at the right. All three units are covered to prevent temperature increases resulting from the sun's rays.

NEW MEXICO POTASH PRODUCER

Combines Chemical and Metallurgical Techniques at New Plant . . .

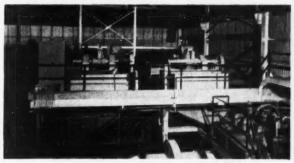
A new U. S. producer for the quality potash market, Duval Sulphur & Potash Company recently started up this modern plant near Carlsbad, New Mexico. A perfect example of the growing convergence of chemical and metallurgical techniques, the plant makes skillful use of the latest developments in both fields.

The flowsheet includes crushing, grinding, classification, hydroseparation, flotation, thickening, centrifuging, crystallization and drying.

At Duval, as throughout the chemical and metallurgical industries, Dorr equipment and techniques play a vital part in wet processing flowsheets. For more information on the scope of the Dorr technical service, write for bulletin No. 7002. The Dorr Company, Stamford, Conn. In Canada: 26 St. Clair Avenue, E., Toronto 5.



Closeup of two Duplex Dorr HX Classifiers. The Primary at right handles raw crushed salt which has been pulped with return brine. Sands go to a rod mill and fines to the Hydroseparator.



General view of the milling section. Rod mill discharge goes to the Secondary Classifier at the right. Sands are discharged to conditioners and fines overflow to the Hydroseparator.



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PRODUCT NEWS . . .

one-tenth the space required for lead batteries. For practical use, however, batteries for automobiles will be about one-third conventional size.

The battery is expected to find immediate acceptance in cars, trucks, railroad locomotives, aircraft engines and all types of farm machinery. Only maintenance needed is "a few drops of water a year."—Sonotone Corp., Elmsford, N. Y.



Mold Release Liquid

All-purpose type dries quickly to hard, smooth, glassy finish.

A new mold release liquid, called Vin-Rock Type R-2, is said to speed the production of plastic products and to cut production costs. It is equally effective when used with phenolics, ureas, melamines, polyesters or epoxy resins.

Designed for compression molding, laminating, casting and lay-up molding, the product is packed in Aerosol cans for easy spraying (see cut). And normally, the number of cycles that can be obtained between applications is greater than with other release agents.

The release is crystal clear and will not discolor any types or colors of plastics. And no oily film or burnt areas are left on the surface.—Vin-Rock, Inc., Cleveland, Ohio.

Glycol Ethers

For high-boiling solvents, rewetting agents, antifoamers and chemical intermediates.

Dow now has two new series of glycol ethers available. The first is made up of monomethyl and monooctyl ethers of polypropylene and polyethylene glycols. "Blocked on one end," they have an average molecular weight of 600, with an alkyl group on one end and a hydroxyl group on the other. Suggested uses include high-boiling solvents, rewetting agents for paper products and antifoamers.

The second group of compounds is a number of phenyl ethers and substituted phenyl ethers of glycols. Called Dowanol 1—ethylene glycol phenyl ether—and Dowanol 2B—propylene glycol phenyl ether—they are available in both technical and purified grades in either commercial or experimental lots.

These almost colorless liquids have found use as high-boiling solvents, as chemical intermediates for plasticizers and bactericidal agents and as fixatives for perfume.—Dow Chemical Co., Midland, Mich.

Chelating Agent

Controls trace trivalent iron over wide pH range.

Versen-ol is a new product that will control the contaminating influence of trace iron. Known chemically as the trisodium salt of N-hydroxy-ethylethylene diamine triacetic acid, the new compound is extremely soluble in water and highly stable throughout the pH range.

It forms 1:1 ferric chelates and prevents hydrolytic decomposition, even in strongly alkaline solutions. Any Versen-ol that remains after chelating the iron will then inactivate other heavy metals or alkaline earth ions until exhausted.—The Bersworth Chemical Co., Framingham, Mass.

Wetting Agent

For preparing a wide variety of of emulsions and dispersions.

According to a recent market study, a new surface active agent, called Monawet Mo, is the most economical wetting agent now being produced. It can be used wherever penetration, wetting out or depression of surface tension are required. And although solutions containing this product will show substantial sudsing, the foam will subside very quickly.

It is the sodium salt of di-(2-ethyl-hexyl)-sulfosuccinic acid and some applications require as little as 1/100 of 1 percent of active material. The product is stable indefinitely in cold or hot water and stability is very good in solutions within a pH range from 5 to 9.

Monowet Mo is available in paste, liquid and gel forms. The paste and gel require vigorous stirring to be dissolved in water.—Mona Industries, Inc., Paterson 4, N. J.

Product Briefs

Thiophenol, C.H.SH, is now available in semi-commercial quantities. It should be of interest to makers of pharmaccuticals, polysulfone resins, dyes, butadiene interpolymers and oil additives.—Evans Chemetics, New York 17, N. Y.

An improved resin cement with complete resistance to alkalis, acids, solvents and salts at temperatures up to 375 deg. F. is said to have superior rheological properties that will minimize construction delays.

—Atlas Mineral Products Co., Mertztown, Pa.

Aluminum fluoride with maximum contents of 0.005 percent chloride, 0.001 percent sulfate and 0.008 percent iron should be useful in laboratory cracking of long-chain hydrocarbons, naphthalene and polymerization of olefins.—Fisher Scientific Co., Pittsburgh 19, Pa.

Three basic coatings for plastic materials can all be pigmented or dyed. One series is for styrene, Royalite, acrylic and certain kinds of acetate; the second is for molded polystyrene; the third can be used in the metallizing phase of plastic decorating.—Sullivan Chemicals Div., Chicago 22, Ill.

First tallow-based synthetic detergent, a 26 percent active slurry form of Igepon, has been put on the market at 9½c./lb. It is said to give high performance at lowest possible cost.

—Antara Div., General Dyestuff Corp., New York 14, N. Y.

Maleic anhydride is now being marketed in briquette form for use in synthetic resins, drugs, rubber chemicals, surface active agents, plasticizers and stabilizers for vinyl plastics.—American Cyanamid Co., New York 20, N. Y.





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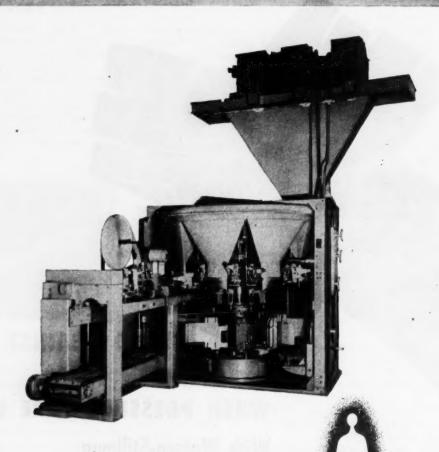
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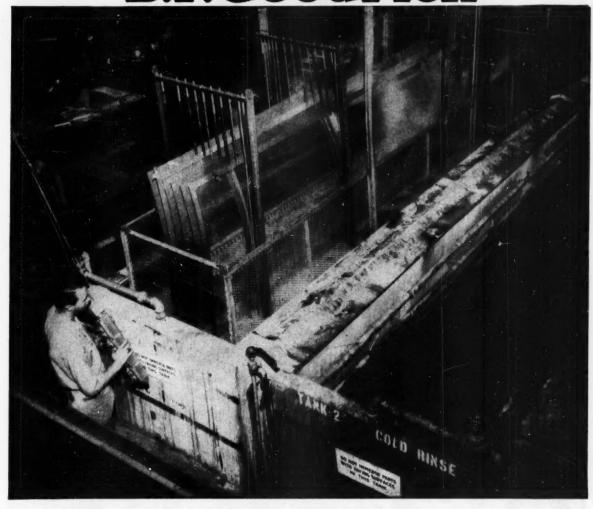
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The Model "A" BAGPAKER is designed and manufactured by Multiwall Bag experts for reliable day in and day out service. It will pay for itself in 1 to 3 years. Over 30 of these machines are now being used in industry. Complete details may be obtained by writing to BAGPAK DIVISION, International Paper Company, 220 East 42nd Street, New York 17, Dept. E-10.







Where airplane skeletons swim in acid

A typical example of B. F. Goodrich product development

Before the wings and body of an airplane can be covered, the frame must be cleaned of the slightest speck. Big tanks like these were used, filled with acids that ate off scale and got the parts ready to be painted.

A faster process was developed but it had to use acids so strong that they would eat through wood and metal tanks. In fact, not even rubber tank linings could stand up against these acids.

An engineer thought of Koroseal, the material developed by B. F. Goodrich that stands practically all acids. It was tried and worked perfectly-the two tanks in the picture are already lined with it. Koroseal made the new process possible, speeding up this vital step in airplane making as much as 50%.

Koroseal flexible material is but one example of the product development and improvement that is always going on at B. F. Goodrich. Every product that B. F. Goodrich makes—V belts, conveyor belts, hose and many other things-is constantly being studied by practical engineers to see how it can be improved from the user's standpoint, how it can be made to last longer and do a better job.

The tanks in the picture were lined by The Barber-Webb Company for Lockheed Aircraft Corp.

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Bulletin 709 Automatic Starter

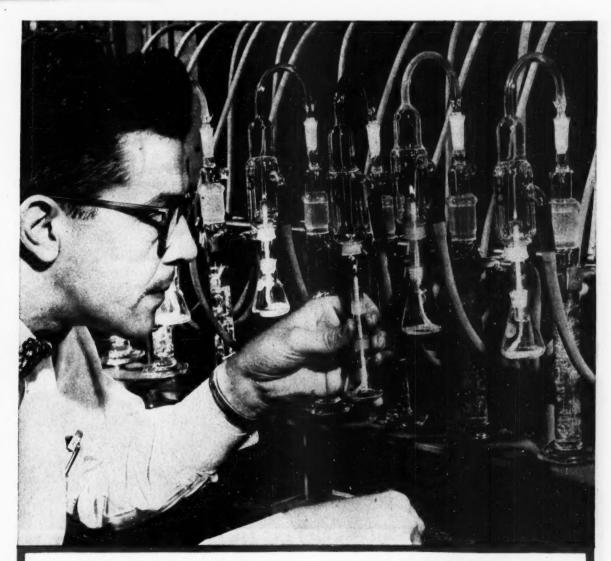


Bulletin 609



The Sign of Quality in Motor Control

Close-up of the stainless steel storage tanks in the process room of the Ricck-McJunkin Dairy Co., Pitts-burgh. Each tank has an Allen-Bradley Bulletin 609 Manual Starter in a NEMA 4 Watertight Enclosure.



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AVAILABILITY — with water terminals in industrial cities, Esso Solvents are always available in bulk.

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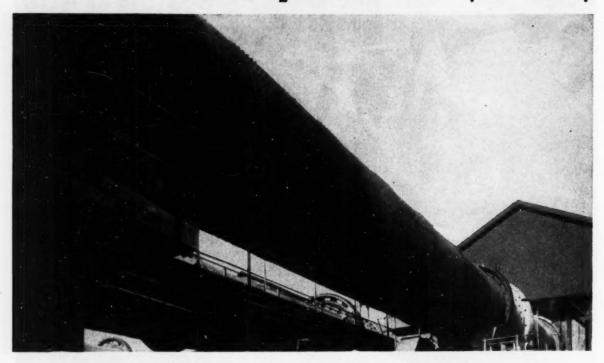
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ORIGINAL WAELZ KILN

built in 1929 by Vulcan for The New Jersey Zinc Co. (of Pa.)



Illustrated above is an original 10' x 140' kiln that was installed in 1929. It is used for the treatment of low grade zinc ore using the WAELZ process. At the time of its installation parts of the kiln included the older type supporting and thrust bearings and drive

Any information on items listed below will be sent to you immediately:

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mechanism. This kiln is in daily operation after nearly 25 years of continuous service, and it is still producing its share of the product involved.

Proved Performance of a Vulcan Rotary Kiln is what the above shows... and this performance is also the result of fine co-operation between the engineering personnel at Vulcan and the engineering personnel and operators of The New Jersey Zinc Company (of Pa.).

This great Company along with many more throughout the United States and the world have come to regard Vulcan equipment as Good... Dependable... Equipment. If any information regarding Rotary Kilns is needed, The Vulcan Iron Works and its 105 years of experience is ready and able to serve you. Write for Bulletin No. A-442 today.

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CABLE ADDRESS

How valve components of Du Pont "Teflon"* are giving improved performance at less cost

Du Pont "Teflon" tetrafluoroethylene resin has found increasing use as a material for valve components—gaskets, packings, seats and discs, plug valve parts and diaphragms. It provides a unique combination of properties of particular interest to manufacturers and users of valves.

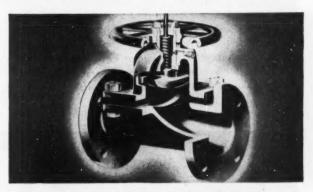
- CHEMICAL INERTNESS. "Teflon" is completely unaffected by acids, alkalis, aliphatics, aromatics, chlorinated hydrocarbons... all chemicals except molten alkali metals and fluorine at elevated temperatures.
- HEAT RESISTANCE. Gives continuous service up to 500°F.
- LOW-TEMPERATURE TOUGHNESS. Has been used as low as -460°F.
- Low coefficient of friction. Lets the valve operate easily. Requires no lubrication.
- EROSION RESISTANCE. Resists erosion by impinging fluids.

Valves with components of Du Pont "Teflon" are especially useful to manufacturers of: chemicals, fertilizers, petroleum, soap, chlorine, foods, plastics, sugar, dyes, insecticides, rubber, textiles, explosives, paper, pharmaceuticals, photographic film.

The Polychemicals Department of the Du Pont Company supplies "Teflon" in the forms of molding powders and aqueous dispersions. These forms are converted into various valve components and molded articles by a number of manufacturers for use in chemical and allied equipment. For further information, write: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 253, Du Pont Bldg., Wilmington 98, Delaware.



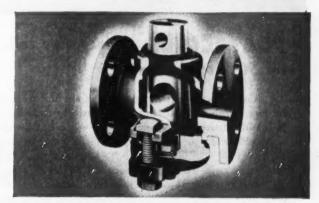




VALVE DIAPHRAGMS demonstrate the chemical inertness and thermal stability of Du Pont "Teflon," This diaphragm of pure "Teflon," above, was designed for continuous operating pressures of 100 psi and temperatures of 400°F. The valve is made by Hills-McCanna Co., Chicago.

GASKETS AND PACK-INGS of "Teflon" often outlast the valve itself. Available in many forms for varied valve uses. Du Pont "Teflon" resists corrosive attack, insures a tight seal. Pictured is a chemical porcelain valve made by the Lapp Insulator Co., Inc., LeRoy, N. Y.





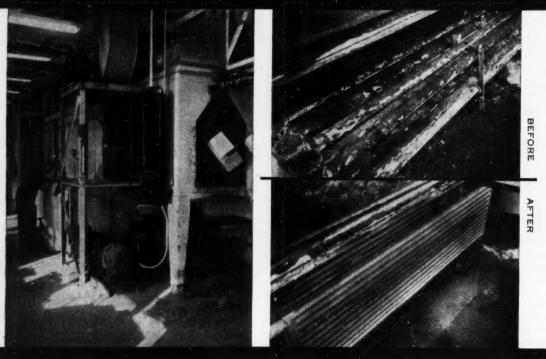
PLUG VALVE COMPONENTS (sleeves and cock washers) utilize the low coefficient of friction and non-adhesive characteristics of "Teflon." They prevent sticking or freezing in the valve body, often simplify design, give excellent results. The valve above is made by The Duriron Co., Inc., Dayton, O.

warm-up time reduced 75% as

PLATECOILS cure coil-itis*

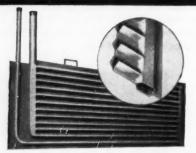
Burroughs Corporation has reduced warm-up time in their phosphate coating system from 2 hours to 1/2 hour by replacing original pipe coils with Platecoils. They have also saved \$1,440 a year in maintenance costs as the pipe coils coated badly and required chipping at least once a month while the Platecoils have required no maintenance in over a year. In addition, the Platecoils cost less to install and take 50% less space in the tank.





PLATECOILS replace pipe coils for 50% of the cost

**Coil-itis is the constant doctoring of wet processing tanks for pipe coil troubles. It can be cured easily by replacing pipe coils with Platecoils. Immediately, you will notice the difference as Platecoils put new life and profits into your heat transfer processes. They heat or cool 50% faster and take 50% less space in the tank. They save as much as 50% in initial cost and 50% in maintenance costs in addition to overcoming the limitations and operating difficulties of old-fashioned and outmoded pipe coils.

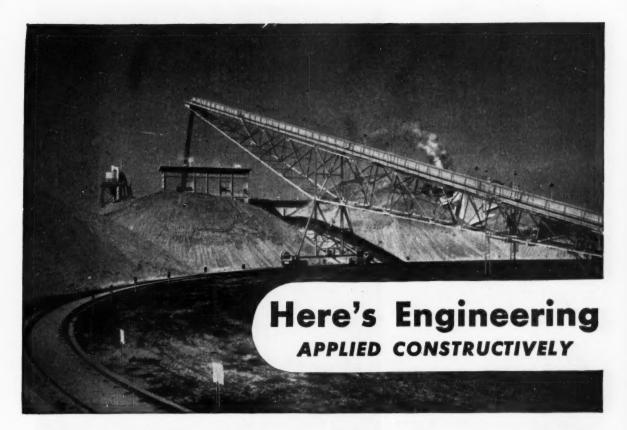


Bulletin P61 shows how Platecoils are replacing pipe coils at a savings throughout industry. Send today for your copy.



Platecoil Division, TRANTER MANUFACTURING, inc., Lansing 4, Michigan

For fast shipment see your local distributor



A belt stacker designed by Jeffrey Engineers becomes an important part of a new-type storage system installed in Florida. Result: Continuous, dependable operation and accurate blending.

Saving: A unique system, the facilities of which prevent delay of railroad equipment and provide better service to customers by permitting quicker deliveries of more-accurately-blended phosphate rock.

How it works: From track hopper rock is fed at 600 to 800 T.P.H. on to a Jeffrey 36" belt conveyor, running up an 80-foot high Stacker which pivots (see photo) over a wide semicircle. Rock is dropped on

storage piles consisting of various grades at different points. Grades are blended by proportioning through gates and reclaimed by other Jeffrey belts operating in tunnels under piles. Rock can be removed at controlled rate from any point in the pile, or at several points at once.

This is just one of the many Jeffrey-equipped jobs on which our engineers projected an ingenious application of the Belt Stacker. For applied engineering on those tough assignments — call on Jeffrey.

• Car Pullers Bucket Elevators
Pulverizers Magnetic Separators
Coolers Stackers

Grizzlies Crushers
Chains Dryers
Conveyors Packers



IF IT'S MINED, PROCESSED OR MOVED
...IT'S A JOB FOR JEFFREY!

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PLANTS IN CANADA, ENGLAND, SOUTH AFRICA



CHOOSE WAGNER UNIT SUBSTATION TRANSFORMERS

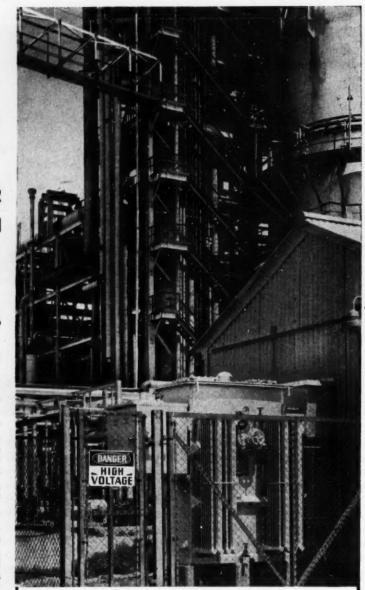
for <u>always</u> dependable power...

Here's dependability at work! This Wagner liquid-filled unit Substation Transformer feeds the catalytic unit at The Carter Oil Company refinery in Billings, Montana.

You'll find hundreds of Wagner Transformers, furnishing always dependable power, in spots where failure would incur great cost, because Wagner Transformers are known for their unfailing dependability—a reputation backed by more than sixty years of transformer building experience.

Wagner Unit Substation Transformers, both liquid-filled and dry-type, are carefully designed to meet distribution requirements. Both liquid-filled and dry-type unit substation transformers are built in ratings through 2000 kva, 15 kv and below—you can choose the type and rating that exactly meets your load-center distribution requirements.

Bulletins TU-13 and TU-56 give full information. Your nearby Wagner engineer can help you solve your loadcenter problems. Call the nearest of our 32 branch offices, or write us.



This 750 kva, 2400/4160Y to 480 volt, 60 cycle, three-phase, liquid-filled Wagner Unit Substation Transformer feeds the catalytic unit at The Carter Oil Company, Billings, Montana refinery. It is throat connected to switchgear in the adjoining building. Purchased and installed by The Fluor Corporation, Ltd., Engineers and Constructors for the Petroleum, Chemical and Power Industries, Los Angeles.



WAGNER ELECTRIC CORPORATION
6407 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

WAUKESHA's 321

(titanium stabilized) STAINLESS STEEL CASTINGS





NOW IMMEDIATELY AVAILABLE

-- TO SOLVE YOUR MACHINING AND WELDING PROBLEMS

You can count—just on the fingers of one hand—the foundries who can successfully cast No. 321 stainless steel with titanium. But WAUKESHA metallurgical engineers have found the secret . . . WAUKESHA castings of 321 are completely unaffected by welding processes; their high corrosion resistance is unimpaired.

And - as in all WAUKESHA castings in the 300 and 400 series, castings in 321 come to you smooth in surface, dimensionally correct, pin-hole, pit and blow-hole free. They are so uniform in texture that machining is never a problem.

WAUKESHA'S large production facilities plus a highly organized insistence on clock-like production schedules will justify your confidence in "on the dot" deliveries.

So, just send us a pattern - no matter how intricate and difficult. We'll make a sample casting for you with no obligation. Give WAUKESHA a trial-today.

EQUIPPED TO SERVE YOU FROM BLUEPRINT through the finished casting



Waukesha Foundry Co.

Then you buy welding elbows



Why take <u>less</u> when you can get <u>more</u>?

ADVANTAGES OF MIDWEST

- * They save pipe.
- ★ They often eliminate short nipples and their extra welds.
- *They save time and money in lining up and clamping pipe and fitting.
- * They make it easier to apply slip-on flanges.
- They remove the circumferential weld from point of maximum stress and can be sleeved.
- *THEY COST NO MORE THAN OTHER ELBOWS.

As shown in the illustration above, Midwest "Long Tangent" welding Elbows have straight ends equal to ¼ of the nominal fitting diameter (a 12" elbow has tangents 3" long). For the reasons listed at the left, substantial savings are made on many piping systems by using Midwest "Long Tangent" Elbows. For more information about them, write for Catalog 54.

MIDWEST PIPING COMPANY, INC.

Main Office: 1450 South Second Street, St. Louis 4, Mo.

Plants: St. Lauis, Passaic, Las Angeles and Baston

Sales Offices:

New York 7—50 Church 51. • Chicago 3—79 West Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
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6722

want a HIGH VACUUM rotary pump that pumps WATER VAPOR?

Here's the NEW
GAS BALLAST PUMP
backed by
MILLIONS OF HOURS
of trouble-free operation

Ends Water Vapor Trouble Maintains Fast Pump Down Time

Eliminates Oil Reclaiming Greater Capacity Under 1 mm Hg Up To 80% Less Oil Charge Capacities from 1½ cfm to 400 cfm Pressures Down To 10-5 mm Hg

Here's important news for everyone who works with high vacuum. The new NRC Rotary Gas Ballast Pump gets it for you faster — saves you time and money and is backed by millions of hours of trouble-free operation.

By keeping water vapor from condensing, this pump prevents contamination of the pump oil. The result—it never loses capacity like conventional rotary pumps when pumping condensable vapors. It continually maintains a fast pump down rate.

NRC Rotary Gas Ballast Pumps are available in a complete line of vane, piston-type and 2-stage pumps.

Send today for new bulletin explaining principle, construction and operation data on the NRC Rotary Gas Ballast Pump.

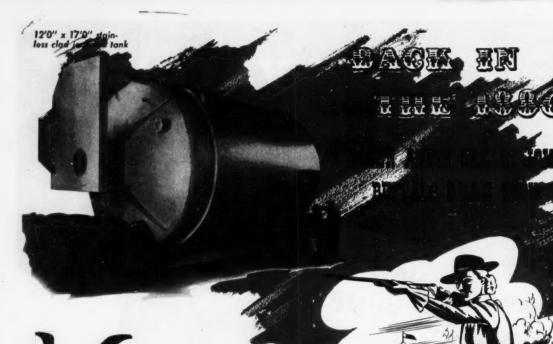




National Research Corporation

Equipment Division

160 Charlemont Street, Newton Highlands 61, Mass.



WAS MAKING

INDIVIDUALISCHEMICAL EXTERNAL

Way back in the days when audiences were held spellbound by the marksmanship of Annie-Get-Your-Gun Oakley who shot coins tossed into the air—chemical manufacturers were hitting a new han mark in production with KOVEN equipment made to their exact needs. And now more than ever, KOVEN helps chemical plants maintain top quality and output at lowered costs—with Individualized ment fabricated to their precise require ments. Call or write for a consultation—no obligation. Send for facilities Catalogue #490.

Complete modern facilities including X-ray inspection and stress relieving which insure quality control. KOVEN equipment in all commercial metals and alloys include: pressure vessels, extractors, mixers, stills, condensers, kettles, tanks, chutes, containers, stacks, breechings, coils. Fabrication to A.S.M.E. Code Par. U-68 and U-69 a speciality.

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& BRO., INC.

KOVEN FOR INDIVIDUALIZED EQUIPMENT SINCE 1881

al rotary



Here's aluminum Chloride

in the RIGHT SIZE for your use

Most often, a particular process using aluminum chloride, anhydrous, works best with a selected particle size.

We have taken technical liberties in this picture (exposing aluminum chloride to the air) to show you the four sizes available from Hooker.

Extra work of screening isn't necessary when you specify Hooker aluminum chloride. The four sizes give you a choice that will meet just about every process requirement:

1. Extra fine grind is unscreened, with

90 to 95% passing 40 mesh.

- Fine grind is unscreened, practically all passing 20 mesh.
- Coarse grind is unscreened, 1 mesh and finer. It contains 25 to 35% finer than 20 mesh.
- Coarse screened is the same as coarse grind (No.3), but is screened to remove 20 mesh and finer.

Before re-ordering your requirements, get the facts on Hooker aluminum chloride. For technical data, just phone the nearest Hooker office listed below, or mail the coupon today.

Need other chlorides? This is only one of several metal chlorides available from Hooker. Chlorinated organics and inorganics are specialties with us; we've been making them for more than 30 years. If you need a special chlorine-containing compound in quantity, we may be able to produce it for you economically. To find out quickly, just phone the nearest Hooker office or write us today.

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CHICAGO	CEntral 6-131	1
LOS ANGELES	NEvada 6-382	6
NEW YORK MUrr	ay Hill 2-250	0
NIAGARA FALLS	665	5
TACOMA B	Roadway 121	5

HOOKER ELECTROCHEMICAL COMPANY,

5 Forty-seventh St., Niagara Falls, N. Y.

Please send:

- Data sheet on Hooker aluminum chloride, anhydrous
- ☐ Bulletin 100 describing Hooker products and services

Title.

empany Address

HOOKER CHEMICALS

- From the Salt of the Earth -

HOOKER ELECTROCHEMICAL COMPANY

NIAGARA FALLS . TACOMA . MONTAGUE, MICH. . NEW YORK . CHICAGO . LOS ANGELES

YOU CAN PUMP IN CONTROLLED VOLUME

HYDROCHLORIC ACID... ALL CONCENTRATIONS
CHLORINATED HYDROCARBONS
CORROSIVE METALLIC SALT SOLUTIONS

DILUTE ACIDS
MIXED ACIDS
WITH

Lapp PULSAFEEDER

PLETELY NON-METALLIC CONSTRUCT

PUMPING HEAD,
CONNECTION,
VALVE HOUSING,
INLET and OUTLET
CONNECTIONS OF
LAPP CHEMICAL
PORCELAIN TUFCLAD ALUMINA
OXIDE
VALVE BALL

TEFLON
VALVE SEATS

KELF
DIAPHRAGM

Lapp Pulsafeeder is the combination piston-diaphragm pump for controlled-volume pumping of fluids. Reciprocating piston action provides positive displacement. But the piston pumps only an hydraulic medium, working against a diaphragm. A floating, balanced partition, the diaphragm isolates chemical being pumped from working sump parts—eliminates need for stuffing box or running seal. Pumping speed is constant; variable flow results from variation in piston-stroke length—controlled by manual hand-wheel, or, in Auto-Pneumatic models, by instrument air pressure responding to any instrument-measurable processing variable.

Solid Lapp Chemical Porcelain, combined with parts of alumina ceramic, teflon and Kel-F plastics, is used for the liquid end of this model of Lapp Pulsafeeder. All parts which can come in contact with liquid being pumped are non-metallic, chemically inert. Thus, positive-displacement metered pumping of "hard-to-handle" corrosive chemicals is made certain and permanently trouble-free.

WRITE FOR BULLETIN 300

with typical applications, flow charts, description and specifications of models of various capacities and constructions. Inquiry Data Sheet included from which we can make specific engineering recommendation for your processing requirement. Write Lapp Insulator Co., Inc., Process Equipment Division, 114 Wilson Street, Le Roy, New York.

CLAD STEEL EQUIPMENT HELPS TRIPLE THROUGHPUT, PROTECTS GLYCERINE PURITY

Even after slow and costly distillation, this soapmaker was plagued by poor quality "yellow distilled" glycerine. Then a new distillation unit was designed featuring a still pot with solid nickel coils for faster heating, nickel-clad steel shell for vital corrosion resistance. Results: redistillation eliminated, throughput tripled, and a 70% cut in fuel costs which saved \$7,000 a year.

The advanced design of this new equipment called for both the performance and economy of clad steel. Nickel cladding, inseparably bonded to the lower cost carbon-steel backing, does the work of expensive, solid high alloy in plate form at substantial savings. Clad's corrosion resistance protects the product economically, assuring that it will be pure and free from contamination. Important also, the still has the strength needed to withstand high vacuum operation.

Equipment performance like this results from teamwork between the equipment builder and design and production engineers. Are you looking for maximum productivity . . . low-cost, trouble-free operation . . . and long equipment life? You'll find that sound engineering and modern fabrication techniques employing versatile clad steels can provide these advantages for you. It pays to consult your fabricators early in your planning. They will work with your engineers and consultants, can often provide cost-saving suggestions in giving you the specialized equipment you want.



Multiple distillation was eliminated with this new corrosion-resistant clad steel still.

Ask one of your fabricators to show you the new Lukens clad steel movie, "Equip for New Profits." Here—in full color and sound—are factual accounts of how clad steel equipment brings new economies. Its story contains ideas of interest to everyone concerned with production efficiency and economy. Or contact Manager, Marketing Service, Lukens Steel Company, 678 Lukens Building, Coatesville, Pa.



KENS CLAD STEELS

STAINLESS-CLAD · NICKEL-CLAD · INCONEL-CLAD · MONEL-CLAD

PRODUCER OF THE WIDEST RANGE OF TYPES AND SIZES OF CLAD STEELS AVAILABLE ANYWHERE

Guaranteed TO SHUT TIGHT*

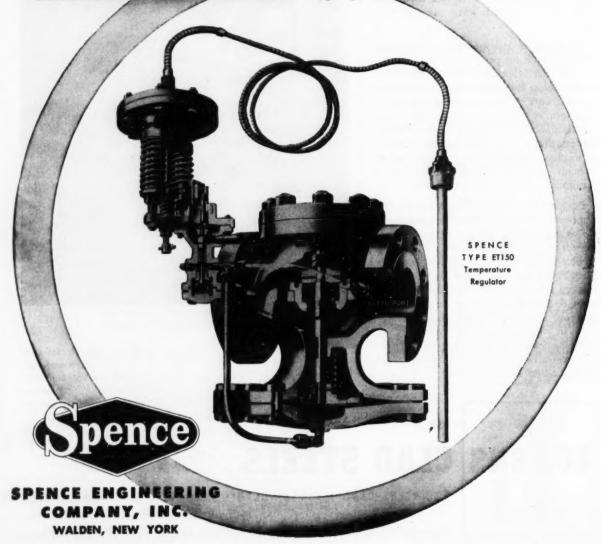
When equipped with a SECO Metal Seat and Disc on steam service and protected by an approved Strainer, a Spence Regulator is guaranteed to shut tight when the demand for steam ceases.

Expensive steam leaks due to a lack of absolutely tight shutoff are eliminated in Spence Temperature Regulators. Here is why we can make such a guarantee:

First, our temperature regulators are of the single seat design. Seats and discs are made of durable SECO Metal. More than 20 years experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year without requiring expensive repairs or special

Want more facts? Write for Bulletin T50 giving full-details.



Heat in a Hurry-at Low Cost!

CHROMALOX

Pre-engineered PACKAGED Electric Heaters

COMPLETE HEATING UNITS READY FOR YOUR JOBS-FROM THE WORLD'S LARGEST STOCK OF STANDARD EQUIPMENT

ARTM Automatic Immersion Heaters



- . ELEMENTS . THERMOSTAT
- CONTROL
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. METAL SHEATHED ELEMENTS

CHROMALOX

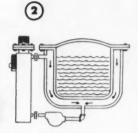
Electric Heat for Modern Industry

DESIGNERS AND MANUFACTURERS OF ELECTRIC HEATING UNITS EXCLUSIVELY SINCE 1917



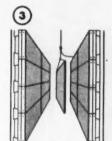
IMMERSION HEATERS

Screw-in immersion heater used in typical liquid heating application. Thermostat controls temperatures.



CIRCULATION HEATERS

Typical application of circulation heater connected to process kettle. For temperatures up to 700°F.



RADIANT OVEN PANELS

CHROMALOX PACKAGED ELECTRIC HEATERS are ready to go to work on the heating jobs in your

plant. Easy to install, they may be used as permanent or portable heat sources to give you clean, dependable, accurately controlled heat at temperatures required. Heaters are available for degreasing, cleaning, pickling and plating; for melting greases, asphalts and similar viscous fluids; for heating air and other gases; and for preheating fuel oils and superheating steam.

> Nationwide application assistance, plus immediate delivery from the world's largest stock of electric heating equipment.



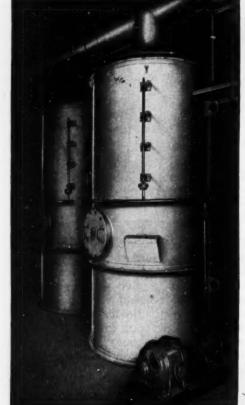
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Please send me Chromalox Catalog 50. Have a Chromalox Application Engineer get in touch

Company_

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MAHON FOG-FILTERS AT WORK

The installation illustrated above was specially designed for the Motor State Oil & Grease Co., Jackson, Mich. PROBLEM: To eliminate H₂S eder from sulphonoted grease manufacturing operations. The problem was complicated by grease and eil fumes present in H₂S gas. SOLUTION: A two-tower Feg-Filter connected in series was designed with high pressure water fog collecting practically all of the grease and oil fumes in the first tower. A caustic solution nplayed in the second tower and fagged at wer pressure removes the remaining H₂S from a air before it is exhausted into the atmosphere.

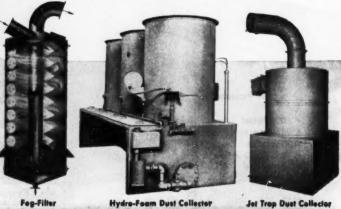
Special equipment engineered to solve individual problems posed by dusts of all kinds, fly ash, chemical fumes, gases of any temperature, aerosols, and other troublesome air polluents

In dealing with air contaminants, each individual air cleaning problem must be approached with a view to determining what type of collector or filter is required to produce maximum results under existing conditions. Study and analysis of the character and extent of the polluent is therefore imperative in arriving at a satisfactory solution. Mahon dust and fume control engineers have, over a period of years, developed and perfected special Wet and Dry Collectors and Fog-Filters which have proved highly successful in coping with all types of industrial air contaminants—a few are illustrated here . . . they are serving today in some of the most difficult and mandatory air cleaning jobs in industry. Each installation has been engineered to do the specific job. If you have an air pollution problem, regardless of its character, it will pay you to call in a Mahon engineer and let him show you what Mahon equipment has done with like polluents under conditions comparable to your own. See Mahon's Insert in Sweet's Mechanical Industries File for further information, or write for Industrial Equipment Catalog A-653.

C. MAHON COMPANY THE Main Plant and Home Office, Detroit 34, Michigan

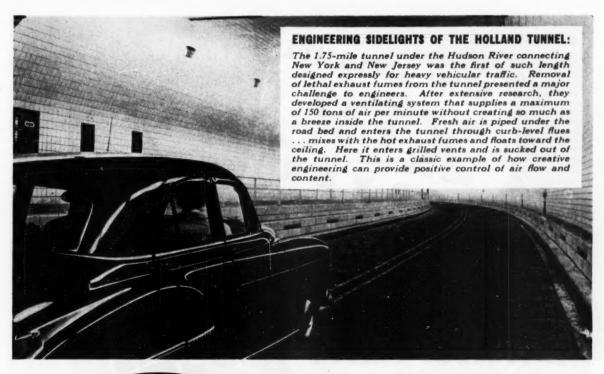
Engineers and Manufacturers of Dust and Fume Control Equipment Including Cyclone Collectors, Hydro-Foam Collectors, Jet Trap Collectors, Hydro-Filter Collectors, and Fog-Filters and Cupola Stack Washers.

All Mahon Equipment is Erected by Mahon to Insure Complete Satisfaction.



Hydro-Foam Dust Collector

Jet Trap Dust Collector



Control is the Important Feature in Traylor Rotary Kiln Design

With a Traylor Rotary Kiln, coordinated control of all the factors entering into thermo-processing assures an efficient flow of material timed to the specific requirements of your product. This is the result of Traylor's practice of engineering each kiln to specifications set by you . . . the customer. This, plus the fact that there's over half a century of engineering know-how behind each Traylor Kiln, assures you of superior quality control and increased output. In addition, Traylor experience gives you the bonus features of adjustable kiln supports and single section rigidity of all-welded steel sheels ... assuring alignment that cuts maintenance costs and reduces power requirements. Put this experience to work on your particular problem. Although each Traylor Kiln is built to individual specifications, bulletin 1115 illustrates and gives a general description of Traylor's many design features. Send for your free copy today.

TRAYLOR ENGINEERING & MFG. CO. 621 MILL ST., ALLENTOWN, PA.

SALES OFFICES: New York . Chicago . San Francisco Canadian Mfra: Canadian Vickers, Ltd., Montreal, P.O.

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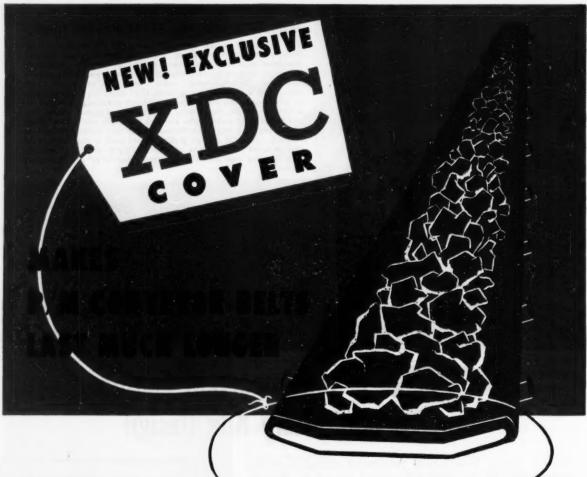






Secondary Gyratory Crushers

Jaw Crushers



you get More use per dollar at no higher cost

Now, an amazing new conveyor belt cover compound developed by Raybestos-Manhattan provides phenomenal resistance to wear and tear. Most conveyor belt failures start with wear of the cover. "XDC" Cover greatly extends the life of R/M Conveyor Belts by giving protection never before attained against wear, abrasion, cuts and tears which lead to costly internal damage. The new "XDC" Cover greatly increases the benefits of Raybestos-Manhattan's other

outstanding developments in conveyor belt design . . . Constructions like extra flexible RAY-MAN "F," extra-cushioned HOMO-CORD, HOMOFLEX and extra-high tension RAY-MAN. This major advance in rubber engineering puts longer life, "More Use per Dollar" into tough, dependable R/M Conveyor Belts. When you are thinking about conveyor belts, call an R/M representative.



MANHATTAN RUBBER DIVISION - PASSAIC, NEW JERSEY

RAYBESTOS - MANHATTAN,















Roll Covering

Other R/M products include: Industrial Rubber * Fan Belts * Radiator Hose * Brake Linings * Brake Blocks * Clutch Facings Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls



WHY
USE 2
WHEN

WILL DO?

When a new method enables one man to do the work of two, it's time for a change. That holds true for pipe insulation, too.

In applying steam piping and equipment insulation, labor is a big cost factor. Why apply two layers of insulation to accomplish what one (Calsilite) will do?

Ruberoid's Calsilite is a molded calcium silicate insulation. It withstands a soaking heat, indefinitely, up to 1250° F. It absorbs moisture and dries out without losing efficiency. It is light in weight. Calsilite comes in both pipe covering sections and flat blocks to fit every application. It's probably the best buy for your next job. Get in touch with your Ruberoid Calsilite Applicator, or send the coupon below.

For single layer efficiency, application economy and protection against water, normal acids, alkalis, or atmospheric conditions, specify

Calsilite

ASPHALT AND ASBESTOS
BUILDING MATERIALS

The RUBEROID Co.

The RUBEROID Co. 500 Fifth Ave., N. Y. 36, N. Y.

Please send me the following:

- Calsilite data folder which shows physical properties, unit heat loss chart, styles and finishes.
- Calsilite Pipe Covering sample.
- Calsilite Block sample.

NAME_

COMPANY

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CITY

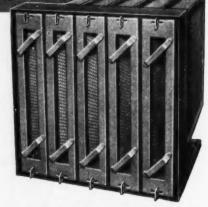
ZONE STATE

CHEMICAL ENGINEERING-March 1954



Illustration showing range of filtering media. Extreme right, $\frac{3}{4}$ " thick cotton batting. Remaining pads are of spun glass in varying thicknesses and fibre diameters.

Are you the 1 in 1000 who can use this DEEP BED AIR FILTER?



Front view of Deep Bed Filter Unit. Air enters open end of wedge-shaped pockets, depositing dust on inside filtering surfaces.

AAF research develops dry-type filter with cleaning efficiencies approaching that of electronic precipitation

We say "1 in 1000" because the Deep Bed filter is not being offered as an "across the board" substitute for electronic precipitators. It was developed by AAF engineers for those rare applications which require the efficiencies associated with electrostatic air cleaning but where the use of this method is impractical.

The efficiency of the Deep Bed filter is the nearest approach to electronic precipitation ever attained with mechanical air filtration. Depending upon the type and thickness of media used, its efficiency in the removal of dust and smoke from atmospheric air, as determined by the Discoloration Test Method, is in the range of 50% to 92%. Tests also show the Deep Bed is 98% to 99% effective

in the removal of bacteria and mold spores.

The standard Deep Bed Unit consists of five wedge-shaped pockets supported in a grid-type frame. The disposable media, consisting of either a special cotton batting or spun-glass pads, is inserted against the flat sides of each pocket to provide the filtering surfaces. The total filtering area of the five pockets is approximately 50 sq. ft. and the normal rating of the unit is 1000 cfm.

For complete information on the new Deep Bed filter, write for Bulletin No. 233. And, if you aren't that "1 in 1000," remember this—every AAF Air Filter, regardless of type, is a better buy because of this continuous and constructive program of research.



American Air Filter

326 Central Avenue, Louisville 8, Kentucky

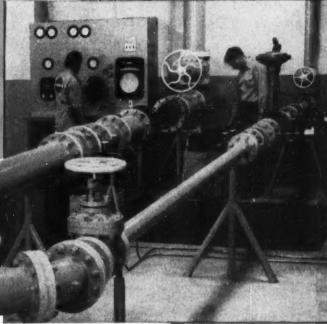
American Air Filter of Canada, Ltd., Montreal, P. Q.



Pre-Proving CLIMAX CONTROLS to Insure On-The-Job Efficiency



Experimentation is the first step in final development. This interesting corner of the new Climax Hydraulics and Experimental Laboratory at 85&B's Tulsa plant is under the charge of experienced development engineers. New Climax designs and improvements start here:



The finished control on the "torture rack." Meter runs flow test the valves up through 10". Strain gauge equipment analyses forces and stress under performance. Control panel in background regulates engines driving the pumps and registers flow data for calculation.

Pump manifolding for the 3 engine-driven pumps which will deliver up to 4500 gallons per minute at a 100 lb. discharge for high volume test. Pumps can also be manifolded for series operation, in which case 300 lbs. of water at 1500 gallons per minute can be delivered.

There's no question about a Climax Control giving the satisfactory service for which it is designed. That performance is tested and proven before the control goes into the field . . . checked for minimum and maximum capacity. Flow, flow effects, valve characteristics and strain results are all evaluated by experienced engineers. Through the new BS&B Climax Control Hydraulics laboratory come a continuing series of answers to the more efficient, safe and profitable application of automatic controls. One test suggests another, one application is adapted to a similar problem. The net result: Through research, better engineering, and accurate pre-testing, comes a more efficient Climax Control.

New Climax Controls
Hydraulic and
Experimental
Laboratory

BLACK, SIVALLS & BRYSON, INC.

Climax Controls Division, Dept. 4-N3
7500 East 12th Street • Kansas City 26, Missouri





Now you can specify...

Comparison of resistance to corrosion. This photograph of tubing subjected to corrosion by gas condensate in the petroleum industry shows (left) condition of internally nickel plated section after 18 months' service, and (right) bare steel tubing in service for 12 months. (Photographs courtesy of Bart Manufacturing Co., Bellville, N. J.)

Seamless Steel Pipe with Integral Lining of Pure Nickel

A pore-free, adherent, nickel coating can be made an integral part of steel pipe and fittings by new techniques and plating equipment.

Standard thicknesses of pure nickel deposited on the inside surfaces range from .007" to .015". Heavier deposits are laid where required.

Applications of nickel-lined pipe are increasing in fields such as the following:

ORGANIC CHEMICALS

Phenol, glycerine, alcohol, formaldehyde and chlorinated organics, as well as many other liquids and gases can be handled by nickel-lined pipe at low rates of corrosion.

CAUSTIC SODA

For concentrations up to 73%, caustic producers and users, alike, find nickel-lined pipe particularly satisfactory for controlling corrosion as well as product purity. Furthermore, the newly produced nickellined fittings allow wide choice of welded fittings.

PULP AND PAPER

Nickel-coated steel pipe combines the corrosionresistance of nickel with the structural strength of seamless piping to provide a superior means of handling hot caustic liquors, green or black. It is not, however, recommended for use where a high free chlorine content exists in the aqueous media, nor to handle sulfurous acid.

NATURAL GAS PRODUCTION

Nickel-lined pipe answers the sour and sweet distillate corrosion problem by providing control for prolonged periods under severe condensate conditions. Advent of sealing type joints for nickel-lined tubing helps solve the old problem of plating API threaded joints.

WATER SYSTEMS

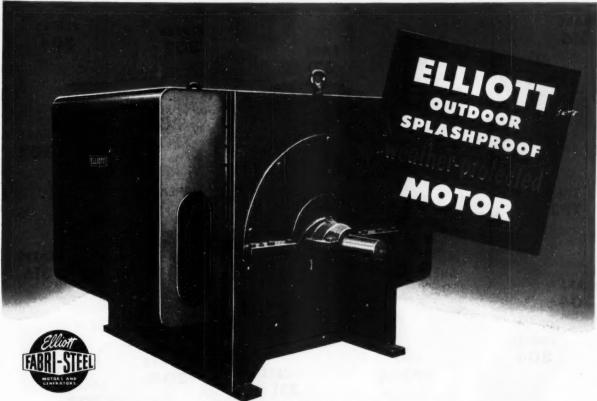
Where water requirements call for high purity, deionizing processes may be used. Nickel-lined pipe proves ideal for handling such deionized waters. It also controls chloride corrosion from brackish water such as that used in Gulf Coast areas as a coolant.

Whatever your industry...when you have a metal problem, send us details for our suggestions.

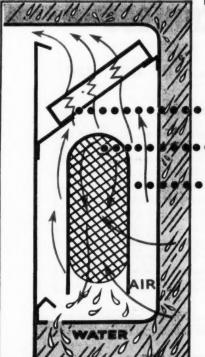


The unbroken interior surface of nickel-lined pipe attests to success of new plating techniques and newly developed equipment. This is a solution to many corrosion and contamination problems.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET



Here's what we mean by "weather-protected"



The above arrangement is standard. However where dust or flying dirt is not a factor, motor can be supplied without the air filter, but with screens and baffles only.

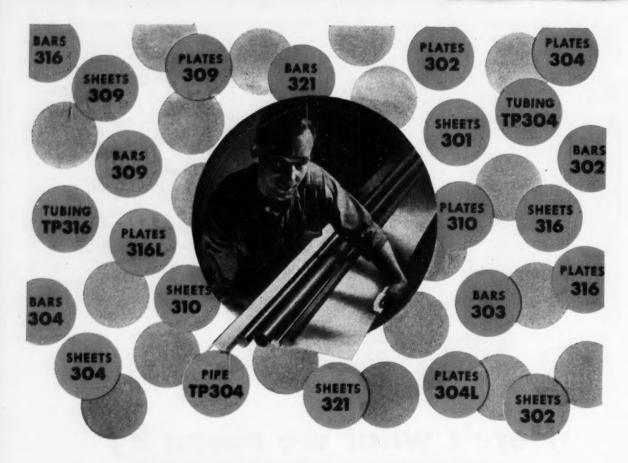
This splashproof motor says "keep out" to everything but air. That means dust, rain, snow, dead leaves, warmth-seeking rodents, snakes, nesting birds and what-not. And here's why:

- • THE AIR FILTER stops dust, snow, or traces of moisture that may have reached up as far as the filter.
- THE AIR INTAKE SCREEN keeps out debris, flying leaves, and small animal life.
 - THE INVERTED "U" BAFFLE makes all incoming air and airborne moisture go down before it can go up, using multiple air reversals and velocity changes to throw off the moisture. That's where moisture says "good-by" and departs through the drainage slot. The construction is in effect an efficient water separator.

Whatever your weather, you can put this motor out in it, just on a plain slab — no cored foundation or other expensive complexity. Why not get the data—see your local Elliort engineer or write Elliott Company, Ridgway, Pa.

ELLIOTT Company

-@



Nickel-Bearing Stainless

Large stocks...quick shipment...for any use!

Once more-without any red-tape-you can get all the nickel-bearing stainless steel you want from Ryerson. And get it fast, too!

Ten different types are immediately available from stock-in sheets, plates, bars, tubing or pipe (see circles above). Many new sizes and types have been added. And it's all time-tested Allegheny stainless steel.

Of course, we also continue to carry straight chrome stainless in a wide variety of types, shapes and sizes for applications where the more expensive nickel-bearing types are not needed. So you can depend on Ryerson for complete stainless service - including the practical assistance of Ryerson stainless specialists in selecting the right type for the

job or in solving difficult fabrication problems.

For quick delivery of anything in stainless just call your nearby Ryerson plant. And you save time-avoid inconvenience by having all your other steel requirements included in the same delivery.

PRINCIPAL PRODUCTS

rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including inland 4-Way Safety Plate Inland 4-Way Safety Plate SMEETS—Hot & cold rolled, many types & coatings TUBING—Seamless & welded, mechanical & boiler tubes

CARBON STEEL BARS-Hot ALLOYS-Hot rolled, cold fin-ALLOYS—Mot rolled, cold finished, heat readed
STANNESS—Allegheny bars,
plates, theets, tubes, etc.
RENFORCING—Bars & Accessories, spirals, wire mesh
BABBIT—Five types, also
Ryertex plastic bearings
MACHINERY & TOOLS—For
metal fabrication

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK . BOSTON . PHILADELPHIA . CINCINNATI . CLEVELAND . DETROIT PITTSBURGH . BUFFALO . CHICAGO . MILWAUKEE . ST. LOUIS . LOS ANGELES . SAN FRANCISCO . SPOKANE . SEATTLE

RYERSON STEEL



- · How to forecast technology—and guide it?
- · How much for plant expansions—and how soon?
- Which way Washington—and how fast?
- · What about manpower, markets, profits?

The Challenge of '54

This is a shakedown year. It's a year of competition—stiff competition—for the chemical process industries, a year of challenges for chemical management and the chemical engineer.

Like 1953, this year will be rich in technological progress. The trend is toward extremes: Higher and lower temperatures, higher and lower pressures, faster reactions, greater purities, more accurate controls, automation.

But it's now plain that technology itself, accelerating at a stunning clip, has become a prime force to be reckoned with.

For technological changes are swifter, more inexorable than ever in killing—as well as in creating—entire processes, products, markets, even industries and economies.

All this leads to one conclusion: Chemical management must spend more and more time predicting long-range technology trends, less in fretting about short-range markets. That's the big challenge.

Capital spending by chemical firms reached

an all-time high last year, boosted productive capacity almost 10 percent. This year it'll be down—but still the second highest in the industry's history.

One trend is now clear: A growing slice of chemical's capital dollar will go into modernizing facilities rather than expanding them.

Last year also panned out to be a recordbreaker in several other respects: Total employment and wages, volume and value of output, profits before and after taxes.

This year has all the earmarks of becoming a close runner-up in all three of these areas.

Sharper competition will hurt some. But it can—and should—add to the overall health of the chemical process industries. That's the challenge—and the opportunity—of 1954.

John R. Callaham



- The Air Force needs pure titanium for jets. Our job: get it.
- Parents plead for gamma globulin to save children from polio.
- Hydrazine grows up to face a brilliant future.
- A new chemical engineering unit operation is born.
 Continuous fractional crystallization gives p-xylene.

Technology Accelerates Its Advance

Two years ago new processes and technological developments were appearing on applications for certificates of necessity. Korean war demands made many new methods of manufacture look more attractive.

But 1953 brought truce in our time and as stockpiling tapered, competition for the civilian purchasing power became more vigorous. With research budgets at almost unbelievably high levels, the sheer force of quantity had to squeeze out some technology advances which had quality.

As the year ended, we were able to tabulate for you some 340 important chemical process and engineering developments which were announced or commercialized during the past two years (Chem. Eng. pp. 187-208, Jan. 1954).

Chemicals Feed on Fats

There's a Benson plan for research at the U.S. Dept. of Agriculture. Complete reorganization of the technical staff in 1954 will activate emphasis on the use of agricultural products as the raw materials of chemical technology. Fats

and oils will be heading out of the storage warehouses onto chemical receiving platforms.

Stepan Chemical reports 85-90 percent yields of fatty alcohols from its new sodium reduction process. You take some tallow, methyl isobutylcarbinol and toluene, and react with sodium. Glycerine is released. The solvents and products are recovered by azeotropic distillation.

Sodium reduction of linseed, soybean and marine oils will be used by Archer-Daniels-Midland at Ashtabula, Ohio, to give higher alcohols. Plant operation is scheduled for June.

Three other USDA developed processes will make news in '54:

Peracetic oxidation—cheap vegetable oils or animal fats are esterified, then oxidized with peracetic acid to give hydroxylated fats. Use is as a vinyl plasticizer.

• Army Margarine—new process gives a spreadable margarine at -4 deg. F. which still holds its shape at 110 deg. F.

 High yield of vegetable oil— Filtration and extraction are combined to give 98 percent oil yield as well as a good meal residue.

Fiber Quality Up

Frankly the public isn't satisfied. Acceptance of the new synthetic fibers has been slow. At least one has been withdrawn from the market completely. But technological advances in synthetic fibers are moving along anyway. Allied Chemical & Dye will make 20 million lb./yr. of its new polyamide fiber at Hopewell, Va. Caprolactam is the raw material for a nylon-like yarn. Process will be ready some time this year.

There's a new modified cotton developed by the Institute of Textile Technology. Superior properties are developed by treating ordinary cotton fiber, yarn or fabric with acrylonitrile.

Glass fibers have found a solid market. Polyester resins, popular for plastic automobile bodies, aren't strong enough and abrasion resistance is low. Glass fiber is the answer when it's put into the mix, especially if bonding characteristics are improved by vinylchlorosilane sizing.

There's a big stretch in nylon. A patented Swiss process claims that by twisting and heat-setting, nylon

 Coal — no matter what you do with it—the profits roll in. Research gives us new developments in coal hydrogenation, low-temperature carbonization, gasification.

stretches to five times normal.

And since the consumer is demanding the same color stability in synthetic fibers that he gets in the natural products, spun-dyed staples had to be developed. Courtaulds, Ala., is spinning ten colors into rayon staple by incorporating dyes into the viscose. Carbide and Carbon is producing dope-dyed dynel as the first fiber besides acetate to be dyed as it's spun.

Fertilizer Goes Automatic

They admit it. The droughts made it a worrisome year for the agricultural chemical business. However, fertilizer chemical plants were making news. Commercial Solvents started operating a continuous (Stengel) process plant for ammonium nitrate at Sterlington, La. By reacting ammonia and nitric acid directly at 400 deg. F., the molten nitrate can be cooled and crushed directly, eliminating evaporation and prilling.

Naco Fertilizer opened the plant of the future—almost completely automatic handling of fertilizer—at Ft. Pierce, Fla. Continuing the continuous trend, Stauffer Chemical adopted an Italian process for phosphate fertilizer at Tacoma, Wash. And by continuous ammoniation, TVA treats superphosphate in a rotating cylinder.

The big push was on ammonia. Four new processes were announced in the U. S.:

• Casale (Italian) – Pennsalt at Wyandotte, Mich., combines hydrogen from electrolytic chlorine with nitrogen from liquid air.

 Partial oxidation – Spencer Chemical at Vicksburg, Miss., synthesizes ammonia by partial oxidation of natural gas. Claims costs are 6 percent lower.

• Pressure reforming-Used by



Shell Chemical at Ventura, Calif. Natural gas is reformed under pressure saving 25-35 percent of compressor horsepower.

• Synthesis gas purification— Blaw-Knox offers this process in the U.S. (developed by German Linde Co.).

Take your choice, gentlemen.

Inorganics Reach Stardom

Inorganic technology put on glamour robes in 1953 and Cinderella outshone her organic sisters as Prince Hydrazine had a ball. Matholin's modified Raschig process was put on stream in a \$3 million plant at Lake Charles, La. This shapely molecule H-N=N-H, has a brilliant future cut out for it—from the impressive heights of a rocket fuel to the simple task of removing free chlorine from HCl.

Other outstanding inorganic developments included a rotating hearth for calcium carbide (National Carbide, Calvert City, Ky.). Riegel-Carolina Corp. adopted Solvay's chlorine dioxide process. By reducing sodium chloride in acid solution, chlorine dioxide is produced safely and economically. Pennsalt does the same job experimentally using sulfur dioxide.

Other oxides got a good workout. Du Pont based a plant on a non-electrolytic process for hydrogen peroxide. Manganese dioxide, battery grade, from low-grade U.S. ores was announced by Western Electrochemical Co. A 10 ton/day plant, using low-current-density cells, is now operating at Henderson, Nev.

The Navy, looking for jet pilot oxygen, has a motion-protected liquid air fractionating column ready to be put aboard all aircraft carriers.

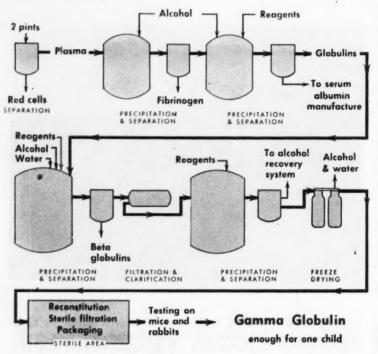
Even old-fashioned sulfuric acid could boast something new in 1953. The Kachkaroff-Guareschi process, developed in Italy, makes extensive use of polyvinyl chloride linings to replace a lead chamber process.

Mercury amalgam cells for chlorine attracted industry interest. Mathieson's rubber-lined cell seems to have a better performance record than the stone-lined De Nora version

And perhaps the most vital of all inorganic advances: Zirconium tetrachloride by direct oxidation, to give a better starting point for the pure zirconium metal needed by the AEC.

Push U, Ti, Zr

Metal technology was as active as ever. Uranium activity needs no explanation. Blockson Chemical



came up with a new source of the precious metal. Florida phosphate rock yields uranium as a byproduct of phosphate chemicals. The Rand mines in South Africa have a more expensive co-product. Uranium is recovered from gold ore residues via an ion-exchange process developed for AEC.

Titanium is next on the popularity parade. The scarce metal is an important construction material for jet engines. With the Air Force pushing industry for a firm output of the pure metal, interest centers on electrolytic decomposition of TiCl. Also, United International Research of Long Island City has a new pilot plant to show. Electrolytic cells melt titanium dioxide down under a blanket of inert gas produce 99.2 percent Ti.

Zirconium is now being produced by arc dissociation of its halides in a process developed for AEC by National Research Corp.

Aluminum research seems to be concentrated in making the producing cells more efficient. Reynolds Metal was trying giant cells. Anaconda Aluminum has a new electrode. And British Columbia Aluminum announced a new process based on quantum mechanics. A

square current wave is claimed to save 30 percent on power.

The Finest Ever

The finest organic chemical is human blood. Chemists and engineers were challenged to break it down to its component parts. Harvard Medical School took a step forward by fractionating blood samples to give a heat stable plasma that is effective against virus hepatitis.

But certainly the most dramatic announcement came out of Kankakee, Ill. Armour & Co. was ready to separate gamma globulin from human blood by centrifuging, buffering, precipitating and keeping a watchful eye on temperatures and concentrations. Lederle Laboratories were using another process starting with human placenta as the raw material. And children with a whopping shot of GG in the right end seemed to be more resistant to infantile paralysis-even if only temporarily. Parents all over the nation were pleading for this miracle prod-

With volunteers lagging into Red Cross blood donor stations, a synthetic plasma extender was sought. Commercial Solvents was among the group supporting dextran as the nominee. Schenley Labs voted for its polyvinyl pyrrolidone. By starting with ethanolamine and butyrolactone they claimed a successful side-stepping of GAF's dangerous high-pressure acetylene synthesis.

Other biochemical developments—a total synthesis of cortisone by Monsanto starting from toluene, a new antibiotic called erythromycin developed by Eli Lilly & Co. and licensed to Abbott and Upjohn.

On the strictly chemical side, Hercules is now making dimethyl phthalates by direct oxidation. And Reilly Tar and Chemical uses acetylene and ammonia to form pyridines and mixed picolines.

Make It From Coal

They were doing things with coal. Most notable achievement: Carbide and Carbon's production of coal hydrogenation chemicals at Institute, W. Va. Almost as interesting, the low-temperature carbonization of coal in a fluidized bed. Coal-char can be used to generate power (U.S. Bur. of Mines with Texas Power & Light) and the chemicals can help pay off the plant (Pittsburgh Consolidation Coal; United Engineers). Chemical yields top byproduct coking by a wide margin.

Du Pont was ready to invest \$4 million in a synthesis gas plant at Belle, W. Va., basing it on partial combustion of coal in a fluidized bed. Underground coal gasification showed promise as an economical way of attacking thin-seam deposits.

Organic Research Heavy

There was heavy activity in other organics. We had two new processes for acetic anhydride: Butane oxidation by Celanese Corp. at Pampa, Tex., and acetone cracking by Courtaulds Ltd. in Coventry, England. Rohm and Haas replaced ethylene by acetylene in making acrylic monomers at Deer Park, Tex. Pennsalt started building a continuous benzene hexachloride plant at Calvert City, Ky. We had two new ways to make p-cresol.

Versatile ethylene oxide is avail-

able from any of these new routes:

- Scientific Design—direct oxidation of ethylene requires no chlorination.
- Shell Development with Lummus Co.—direct oxidation in a fixed bed followed by hydration.
- Atlantic Refining with Vulcan Copper & Supply—fluid bed oxidation on a silver catalyst.

Para-xylene was in the spotlight in '53. Standard Oil (Ind.) scheduled production of it and other mixed aromatics amounting to 14 million lb./yr. Hydroforming is the route. Humble Oil is making p-xylene (for Du Pont's Dacron) using low-temperature re-crystallization.

Finally, as a last minute entry, Phillips Petroleum announced a new plant, a new process, and a new chemical engineering unit operation — p-xylene by continuous fractional crystallization.

Up the Octane

Progress in petroleum and natural gas was concentrated in building 'em bigger and better. New automobile and aviation gasoline specs called for higher octane ratings. Refinerics, by alkylation, adding mixed aromatics, using catalytic reforming or catalytic cracking, tried their best to meet the requirements. The emphasis was on size and efficiency.

The 51 new catalytic reforming plants, scheduled for completion in 1954, will average about twice the capacity of older installations. 4,650 bpd. used to be a good size for a reformer. Today's version is designed to handle 8,500 bpd.

We can see the same trend in catalytic crackers. Old size-15,000 bpd. New size-100,000 bpd.

A few unique developments did show up. Thermofor pyrolytic cracking (TPC), thermofor catalytic reforming (TCR), and fluid coking were all based on moving bed techniques to up-grade less valuable fractions. The Bureau of Mines continued research on shale oil, now our best potential source of synthetic fuels.

We poor used-car jockeys looked hard at gasoline advertisements. TCP was just one example. By adding tricresyl phosphate, Shell and Continental Oil promised us supperior engine performance.

You Can Use Hardwood

Pulp and paper technology made semi-chemical pulping of hardwood a success. With due thanks to chlorine dioxide bleaching it is now possible to spend less time in digestion and make a white enough newsprint from hardwood and softwood pulp mixtures (Great Northern Paper Co.).

Soda pulp from cold caustic digestion (Green Bay Pulp and Paper Co.) can be used for making corrugate when mixed with semichemical pulp.

Pipe It in Plastic

The structural demands on plastic materials directed the technological changes. Most noteworthy was the growing use of plastic piping. Close behind, plastic foams give structural strength with light weight. Vinyl pastes are covering rubber, paper, cloth or unsupported structures. A coating makes the sale of canned soda-pop possible.

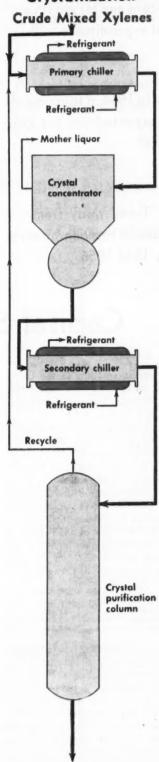
Research on the relation between molecular structure and properties of phenolics by H. L. Bender resulted in compounds that combine fast curing with hot rigidity.

What Else Is New?

But there are a few other things that the up-to-date chemical engineer will have to be familiar with this year. You should have some idea of how they'll make civilian power from atomic energy. You'll be interested in the turbogrid distillation tray (Shell Development Co.), mass flow measured by the Coriolis principle (Control Engineering Co.), liquid metal heat transfer, liquid-liquid extraction by mixer settlers and pulse columns, the principles of entrainment separation.

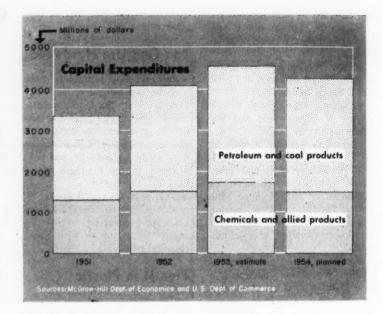
Pollution control will be the outstanding problem facing you. Brush up on dust collectors and the new waste disposal processes—hot digestion and pressure flotation. And, if you're in a water-short area, there's a refinery re-using sewage effluent.

Continuous Fractional Crystallization



98% p-Xylene

- The year 1953 was a record one for plant capital expenditures.
- In 1954, a tapering off is expected—to the 1952 level.
- Trend away from expansion to modernization in 1954-1956.



Capital Spending Reaches Peak-

CAPITAL spending in the chemical industry—and manufacturing industry in general—reached an all-time high in 1953.

Chemical firms increased capital spending by 14 percent over 1952, petroleum manufacturing companies by 7 percent and all manufacturing by 3½ percent. It was a year of great expansion and spending. It probably won't be duplicated again in the immediate future.

► At The Close of 1953—Here are the spending figures for 1953, compared with 1952 (data are from the Department of Commerce):

	Millions i	n
Capital Spending by	1953 (Est.)	1952
Chemical Firms	\$1,650	\$1.451
Petroleum Companies	2,778	2,596
All Manufacturing	12,423	11,994

All this spending boosted productive capacity for all industry. Chemical companies had a 10 percent capacity increase in 1953—maintaining the same rate of increase started at the end of World War II. Only two industries outran chemical firms in postwar expansion. These were transportation equipment (including aircraft) and electrical machinery.

The petroleum industry, while not up to the expansion rate of chemicals, had a healthy 5 percent increase in productive capacity in '53. Some of the highlights of the 1953 expansion:

 National Petrochemicals' \$44 million petrochemical plant at Tuscola, Ill., for the manufacture of hydrocarbons from natural gas.

 The AEC's \$78 million uranium treatment plant at Fernald, Ohio.

 Commercial Solvents' \$20 million ammonia-methanol plant at Sterlington, La.

• Du Pont's \$40 million synthetic fiber plant at Kingston, S. C. for making Dacron.

One of the interesting features of the '53 expansion has to do with where the money came from. In 1952, chemical companies raised \$626 million for plant improvements and expansion from outside sources. In 1953 only \$276 million was raised by external financing—and \$200 million of this was an Allied Chemical & Dye bond issue.

The great majority of the '53 money came out of internal funds.

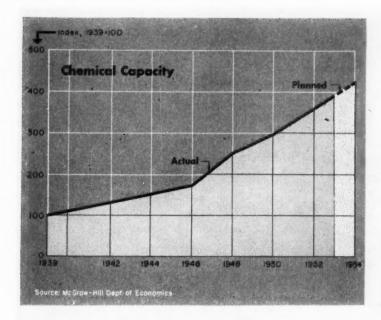
In spite of the excess profits tax, these funds were larger in 1953 than in previous years. This was due to the rapid tax write-offs on new plants—stemming from the defense expansion program.

This defense program was—and still is—a big factor in the national economy. Approximately \$15 billion worth of plant projects were completed in 1953. At the end of the year the program was at the \$21 billion mark—72 percent of the total of issued certificates of necessity. There is no doubt that the program contributed mightily to the 1953 prosperity.

▶ What 1954 Will Bring—What will 1954 be like? In 1953 the chemical and petroleum industries reached the top of Mt. Everest—in terms of capital investment. The only direction they can probably go is down, but how far?

According to a recent McGraw-Hill survey of capital spending plans for 1954, this descent from the mountain top will be gradual.

Chemical companies plan to cut capital expenditures by 14 percent; petroleum companies by 2 percent. All manufacturing plan to cut



- Chemicals increased plant capacity by 10 percent in '53.
- Petroleum companies increased capacity by 5 percent in 1953.
- National Petrochemicals, Commercial Solvents, Du Pont, lead expansion.

Plant Capacity Increasing

back an average of 8 percent from 1953 spending.

But let's look at some figures:

	Millions in		
	1954	1953	
Capital Spending by	(Planned)	(Est)	
Chemical Firms	\$1,419	\$1,650	
Petroleum Companies	2,722	2,778	

All manufacturing except automotive and electrical machinery expect to decrease capital investments in 1954.

Actually the decrease will bring most manufacturing back to 1952 levels. Planned capital spending in 1954 for chemical companies approximates the 1952 levels—and 1952 was no slack year by any standards. Even at that, the planned chemical spending is only topped by the petroleum companies in dollar volume.

There are many reasons behind this inevitable capital spending decline. Here are some of them:

• The period of fast tax writeoffs is about over. At the end of 1953 a grand total of \$29 billion worth of certificates of necessity had been issued. Of this, roughly \$8 billion remains to be completed. Most of this will be cleaned up by the end of 1954—present plans call for 92 percent of the program to be completed by that time.

• The drop in chemical spending will be concentrated in two overexpanded fields—heavy chemicals and rayon chemicals. Capacity in these lines expanded faster than markets have become available.

▶ Division of Money—Manufacturing companies have two choices when deciding how to spend their plant and equipment money. They can either expand or they can modernize. In the next few years, there will be a growing trend toward modernization at the expense of expansion.

Here's how this trend looks:

1952	Chemical Firms	Petroleum Firms	All Manuf.
Expansion	76 percent	42 percent	49 percent
Modernization. 1953		58	51
Expansion	71	40	43
Modernisation.	29	60	. 57
Expension	67	39	38
Modernisation.	33	61	62

Chemical companies still will spend more on plant expansion than industry in general; but even here there is a growing trend toward an increase in modernization.

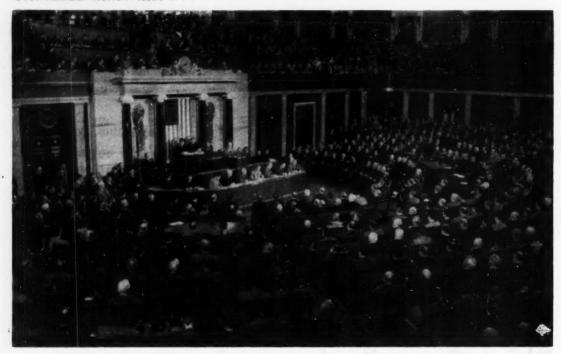
The chemical industry-greatly dependent on the results of research and development-is relying on new products to meet stiffening competition. New plants and new equipment will be needed to make these new products. In the coming years, the chemical industry-and industry in general-will be reaping the rewards of the tremendous stimulus given research and development by the defense program. Technological improvements should develop rapidly. This will, in turn, act as a stimulant for investment in plants and equipment.

Two things seem to be apparent from all these statistics:

• In the next few years, both petroleum and chemical companies will spend large amounts on plant expansion and modernization.

• There is an expected decline in 1954' for plant investments. But this decline will still leave us with the second best year in history.

Over the long run, all signs point to a continued high level of business investment in the chemicals, petroleum and allied industries. They will make a major contribution to general business activity.



Domestic Problems Vex Washington

- Speedier amortization will be relied upon to spur expansion.
- Rougher competition is in prospect both at home and overseas.
- · Important anti-trust activity is on the agenda for this year.
- Look for developments in atomic energy, labor and research, too.

Washington officials this year have their goal fixed firmly before them: November's elections.

With the end of shooting in Korea and prospects for an uneasy peace in the foreseeable future, domestic problems are the key to Washington decisions. And nearly every one of these domestic problems—especially taxes, tariffs and trusts—touches the chemical industry.

Sustain Prosperity—As the new year opened, fear of a recession and a rise in unemployment quickly became the factors coloring most Washington thinking. President Eisenhower set the tone in his address to the nation, opening the Congressional session.

After listing the accomplish-

ments of his first year in office, the President went on to say: "It is ground work that has been laid by this administration in the strong belief that the federal government should be prepared at all times—ready, at a moment's notice—to use every proper means to sustain the basic prosperity of our people."

▶ To Spur Expansion—To maintain industrial prosperity, Eisenhower and his aides are counting on business to continue investing in plant and equipment. They feel that providing incentives to modernize and expand the country's productive facilities is the best guarantee of good business.

► Faster Write-Off Cure—Reliance has been placed on a variety of measures, but perhaps that which rates highest is the proposal to liberalize present amortization procedures.

To the chemical industry, Republican adoption of faster amortization in peacetime is an innovation of prime importance.

The proposal: Permit business to write-off two-thirds of the cost of either machinery or buildings during the first half of its useful life.

'Actually, this gives the businessman only a small advantage over what he has under present rules. The question then becomes: Is this difference enough of a shot in the arm to matter?

Proponents of freer amortization answer flatly, "No." But White House officials behind the proposal argue that a small assist is all the economy needs right now. They point to the extremely high rate of capital investment during 1953, and Commerce Department estimates of continued high investment rates for the first quarter of '54. This, they note, is happening without benefit of any new amortization policies at all.

Foot in the Door-Adoption of present proposals would be a foot in the door to further liberalization, if and when the administration sees the need for it. In fact, further liberalization is promised by the very arguments used to support the small change now. In other words, the increase should be kept small now because the need is small-but if the need grows the policy would be further liberalized.

There's no doubt that the post-Korea program of permitting faster write-offs of plants and equipment certified as useful for defense purposes paved the way for present proposals to adopt a permanent and faster amortization policy in peacetime.

The chemical industry has been among the heavy users of steppedup amortization. According to the Office of Defense Mobilization, more than a thousand certificates of necessity for fast write-offs have been granted the chemical process industry-for projects worth more than \$3 billion.

► A Method In It-The administration is using this tax-easing recommendation, however, to fight another tax bill decision-scheduled return on April 1 of the normal tax rate on corporations, from its present 52 percent to the pre-Korea rate of 37 percent.

Eisenhower maintains that until the budget is more nearly in balance, tax reductions are out of the question-but that present budget savings make possible reductions by whatever is involved the faster write-offs.

► More Tax Changes-Other tax revisions are in the works, too. Of particular interest to chemical men is the proposal to liberalize tax treatment of research and development costs. This will not go as far as the companies would like, however.

It is also proposed to make some income from dividends tax exempt

-perhaps 5 percent-as the first step toward ending double taxation of corporation profits.

► You, Too - The individual chemical engineer is also expected to benefit from the new omnibus tax measure.

• Increasing the present \$600 deduction for dependents is a definite possibility. The consensus is, however, that this will be quite

· Liberalization of the present deduction for medical expenses is also likely.

Coupled with January's automatic, 10 percent cut in individual income taxes, these revisions-if adopted-will put more money into your pocket.

► Cloudy Overseas—Foreign trade outlook for the chemical industry this year is rather cloudy. European - particularly German - competition is stiffening in foreign markets around the world.

Exporters of U. S. chemicals will have to strive hard to hold their own abroad. Europe's exportable surplus is mounting and European exporters are offering increasingly attractive credit and delivery terms.

Declining U. S. economic aid and an expected \$3 billion drop in the U.S. import figure will reduce dollar funds available overseas for purchase of chemicals here. Expect the biggest drop to come in sales to Mexico and Canada.

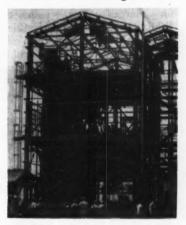
► Rough at Home-Look for stiffer competition from overseas in the U. S. market, too. The Randall Commission's report won't lead to far-reaching liberalization of the U. S. import policy by the time it gets through the Congressional mill. But the shift is in that direction.

Most important action on import policy will probably be:

· Re-enaction of the reciprocal trade act for a period of several years. This would give the President power to negotiate new tariff levels during that time.

• Tightening of the escape clause of the act making it tougher for U.S. concerns faced with foreign competition to get tariff relief. Stricter definitions of what constitutes an import will also be written into the law.

 Substituting the export value of imports for the "foreign value"



Faster tax writeoffs are proposed as an incentive to business to expand and update present facilities.



More foreign competition is expected both overseas and at home. In Congress a hot fight looms over tariffs.



Attorney General Brownell will push a tough anti-trust policy. His group will continue vigilant-but not vindictive.

for duty-calculating purposes. While it would make no immediate change in the tariff level, chemical industry leaders feel that this would be the first assault in an attack on the "American selling price" system of duty assessments, and that it will make dumping easier.

• Liberalization of anti-dumping regulations. Rayon staple importers are pressing Congress and the Treasury to sharpen the official definition of dumping. Their objective is to protect legitimate imports from arbitrary penalties — not weaken rules against general dumping. But any tampering with anti-dumping safeguards will arouse fear in the chemical industry—which well remembers the cutthroat foreign competition of the '20's.

No Anti-Trust Let-Up-Important anti-trust activity of special significance to the chemical industry is on the agenda for this year. Look for key developments in such areas as mergers, cost justification, monopoly cases and the like.

Eager to make a good recordone that will stand up in November—expect the Republicans to press anti-trust cases. Democrats will be sure to attack with glee any indications of softness. Attorney General Brownell will continue vigilant but not vindicative.

New Look at Mergers-Keen interest will focus on the new policy laid down by the Federal Trade Commission, ruling against corporate mergers which "may tend to lessen competition." In the first FTC decision under the new Section 7 of the Clayton Act it was held that no single characteristic of a merger-such as company size alone—is sufficient to measure its effect on competition. A detailed picture of the merging companies and the market is required.

Only after all arguments are heard will the FTC examiners decide the legality of a particular merger.

Studying All Aspects—Broadest reexamination of anti-trust goals and policies since the Sherman Act was adopted, is being made by the Attorney General's National Anti-Trust Study Group. It is checking into all phases of anti-trust.

Recommendations from the group will largely make up the ad-

ministration's anti-trust policy. Some suggestions will be made shortly, but the full report is not due till fall.

► No Softening—A tough line on filing anti-monopoly cases is revealed by a look at last year's record. Since Jan. 20th, when the new regime took office, over 30 new cases have been filed. About the same number were closed—either by consent decree or court decision—in the last half of the year.

This year, priority will be given to the pending cases, in an effort to "clean off the books." Present backlog is around 120 cases, some of which have been dragging for years. As new cases come up, however, expect prompt, vigorous action—not tenderness.

The Justice Department is already behind bills to raise penalties for criminal violations from \$5,000 to \$50,000. Brownell will also ask for power to supoena company records in anti-trust suits.

► Atomic Readjustment — We're due for sweeping policy changes this year in field of nuclear energy. The shift is to peacetime, industrial uses. And, if industry shows enough interest, legislative changes will be made to allow broader industrial participation.

Proposed changes in the present, tightly-drawn atomic energy act provide for:

- Industrial ownership, or control, of nuclear reactors to produce power.
- Industrial ownership, or leasing, of fissionable fuels.
- Some patent protection for industry in the atomic power field.
- Freer access to the government's technical information.
- ▶ T-H Looms Again—Biggest labormanagement clash again figures to be over Taft-Hartley. And, as in 1953, there is a good chance of winding up with no new amendments.

Eisenhower defends the law as "basically sound." But, feeling that it can be improved, he has sent 15 recommendations to Capitol Hill. The limited changes suggested, however, have made neither labor nor management happy, and, with Congress split nearly evenly, best bet is that none will be adopted this year.

► More Unrest—Collective bargaining failed to produce the usual number of critical strikes last year, but this year's outlook is less rosy.

Nationwide steel negotiations are set for mid-year, with the union committed to a demand for a guaranteed annual wage. The steel workers, however, may well settle for pay boosts and more extensive fringe benefits.

GAW won't be forgotten, though. It's this year's major propaganda item. The groundwork is to be laid now, with the big push coming in the auto industry in 1955.

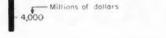
▶ Critical Decision—The chemical industry is sitting in the midst of one of the critical labor decisions of the year. In a test case involving American Potash and Chemical Co., the NLRB will rule on whether to grant craft unions bargaining rights in chemical plants held by industrial unions.

▶ Rubber Plant Switch—Full value, no monopoly, rubber for small users. These are the watchwords of the rubber-producing facilities disposal plan. Official deadline for submitting bids on the government's plants is May 27. After the deadline, the Disposal Commission has seven months for negotiations and for preparing its final report to Congress—due Jan. 31, 1955.

Since it will be the 1955 congress which will have to approve the disposal package, there is already a political shadow over the sale. Some Democrats have lost no time in terming the entire plan a "Republican giveaway."

► Look for These Moves, Too— More changes are crystallizing in other governmental departments:

- Research policies have shifted in the past year. More government work will be farmed out to industry and the schools.
- Patent fees will be upped, as the Patent Office makes an effort to become self-supporting, and to increase its activities as well.
- Distribution statistics and chemical end-use reports will be worked-up by the Department of Commerce. Industry reception will decide the future of the series.
- Expansion goals and stockpile targets set in the past 3 yrs. will be examined and reappraised.



Profits Take Upward Swing

-For Most

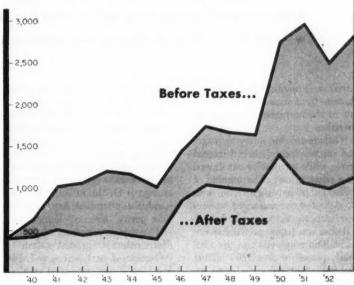
Despite high taxes and falling indexes, most chemical companies managed to raise profits last year. Earnings in 1954 should remain high.

ORE than 75 percent of the chemical companies reporting showed higher profits last year than in 1952—both before and after taxes. And although there will almost certainly be a sales dip this year, cash carnings—the total of net income plus amortization and depreciation—should be as good or better in 1954.

Not all chemical firms were able to maintain their 1952 profit levels. But even most of these suffered only minor declines. And some companies, notably, Mathieson, Du Pont, Monsanto and Shell Oil, attained such spectacular profit increases that they more than offset the failings of their weaker sisters.

For 1954, the outlook is good. Although chemical sales are expected to drop 3-5 percent, as compared with a predicted all-industry slump of about 6-8 percent, the end of the excess profits tax and more accelerated plant amortizations will combine to keep profits high. Also, a third important aid to profits, reduced income taxes, may well come into play.

Under existing law, the corporate income tax rate is scheduled to drop from 52 to 47 percent on April 1. The Eisenhower administration is expected to fight for an extension of the current rate, but Congressional finance committees seem just as determined to push through the full reduction. A compromise at 50 percent seems extremely likely.



CHEMICAL INCOMES rebound in '53 Befor		ore and	after taxes	
	Nine Months (\$000)		Nine Months (\$000)	
	1953	1952	1953	1952
411 7 .1	200			
Abbott Laboratories	\$14,111.4	\$12,774.7	\$7,166.8	\$6,817.1
Allied Chem. & Dye	11,499.5 66,984.5	12,468.4 60,405.9	5,271.5 33,738.8	5,561.9
			21,228.5	19,331.g
American Cyanamid	43,428.5	33,931.8	717.0	
	2,342.0	4,497.8	1,585.7	922.8
American Potash & Chem	2,276.7 24,153.0	1,706.3 29,086.0	11,152.0	13,127.0
American Viscose	4.577.5	3,040.4	1.723.5	1,431.4
Atlas Powder	4,077.6	3,887.4	1.897.7	1,995.4
Bristol-Myers	17.172.0	11,804.0	9,122.0	6,644.0
Cities Service	64,483.9	67,854.1	37,715.4	36,596.7
Commercial Solvents	3,643.6	628.5	1,836.1	447.5
Diamond Alkali	9,326.8	7,408.3	4,703.5	3,795.4
Du Pont.	511,989.1	434,234.1	172,829.1	155,754.1
Freeport Gulphur	7,546.7	6,733.7	6,020.2	5,237.4
Hercules Powder	28.074.1	25,829.4	9,637.5	8,530.8
Heyden Chem	2,165.0	1,847.0	1,010.0	839.1
Industrial Rayon	14.531.5	14,756.7	6.471.5	6,469.7
Interchemical Corp.	6,145.4	3,806.3	2,055.4	1,506.3
Jefferson Lake Sulphur	1,505.3	1,295.7	1,129.7	924.7
Koppers Co	21,041.1	20,877.2	6,678.6	6,887.0
Libbey-Owens-Ford	44,447.6	25,567.2	13,560.6	11,001.1
Lion Oil Co	12,371.2	12,389.8	7,449.9	7,528.1
Mathieson Chem	27,394.7	16,434.7	14,379.9	8,879.7
Minnesota Mining & Mfg	38,583.8	30,952.3	13,708.8	11,442.3
Monanto Chem	43,077.3	29,783.2	19,688.0	16,080.4
National Distillers Prod	19,679.9	18,390.2	9,086.9	9,801.2
Nopeo Chem	2,156.2	1,604.0	714.7	569.5
Parke Davis & Co	13,151.8	27,240.5	6,707.8	13,828.5
Penick & Ford	4,442.2	3,793.9	1,643.7	1,551.5
Chas. Pfizer & Co	21,326.4	16,536.3	10,772.6	8,154.9
Pittsburgh Coke & Chem	5,225.0	2,373.0	2,483.0	1,426.0
Pitteburgh Plate Glass	71,530.8	59,458.8	30,711.8	26,617.6
Rayonier	16,223.2	19,300.6	8,154.2	8,427.6
Rohm & Haas	16,128.0	10,990.0	4.832.0	3,807.0
Shell Oil Co	145,780.5	107,456.7	81,480.5	62,656.7
Standard Oil-California	200,817.4	168,764.0	140.217.4	130,364.0
Standard Oil-Ohio	27,998.2	23,267.7	14,198.2	12,667.7
Sterling Drug	21,677.2	19,537.0	9,127.2	8,087.0
Sun Chem	2,018.2	2.052.6	847.6	822.0
Texas Gulf Sulphur	31,503.1	30,633.9	18,654.1	18,985.0
Union Carbide & Carbon	193,426.7	171,991.1	78,897.6	70,739.6
U. S. Rubber	67,175.2	68,168.7	21,488.3	18,912.1

LABOR

- Last year was one of the best for both labor and management.
- Rising unemployment, however, now has labor apprehensive.
- Look for a rougher time at the conference table this year.

ABOR and management both retain fond memories of 1953—one of the best years ever recorded by either.

Throughout the nation, wages and employment reached record levels, while unemployment dipped to a postwar low. The number of strikes fell off only slightly, but with no strikes of the prolonged, nationwide variety, lost-time was halved.

Labor was happy over the record 62 million employed and the total yearly payroll of over \$200 billion. But the slight year-end rise in unemployment from the low of 1.5 million, coupled with indications of a jump to some 4,000,000 out of work by the end of '54, brought frowns from union leaders. Their concern will be manifest at the conference table in '54.

Last year's absence of any prolonged, industry-wide strike, such as hit the steel industry in 1952, left chemical management thinking the millennium had arrived. Even John L. Lewis neglected to pull his yearly walkout. Labor shortage and labor surplus areas were few, and manpower experts were generally pleased with the balance between jobs and workers. For '54 they look to a continued loosening of the labor supply but, on the darker side, an increase in industry-union skirmishes.

▶ Jobs Aplenty—Total employment in the chemical industry hovered just over the 750,000 mark. After April's peak, when 762,700 were employed, it dipped to 755,000 at year's end. Production payrolls averaged around 515,000 workers about the same as in '52.

For the chemical worker, hourly earnings were up to \$1.87 compared with the 1952 average of \$1.71. This put him well above the average factory worker, whose wages

climbed some 4c. during the year, to a \$1.78 per week peak.

Since the cost of living finally showed signs of levelling out, the wage boost meant a significant increase in purchasing power. This, however, may be offset by a decline in the work week—down from an average of 41.7 hr. in '52 to 41.2 hr.—and the attendant loss of overtime pay.

The specific segments of the industry reflect the general pattern:

▶ Organics—Latest Bureau of Labor Statistics figures show total employment in the organic segment to be 274,900, nearly 8,000 over the December 1952 figure. Average weekly wages hit \$80.40, and the hourly pay evened at \$2. (1952 averages were \$78.28 and \$1.90 respectively)

▶ Inorganics—In the inorganics, employment reached an all-time high in July, some 86,000. At year's end, it was still at a near-record 84,600, and the prospect for 1954 is continued employment at around 85,000.

The inorganic worker was well paid in '52 and over the last year his weekly wages climbed almost \$4 to nearly \$85 per week. During the year his average hourly pay jumped 14 cents, to about \$2.06.

▶ Index Out—Labor was apprehensive at the slide taken in the economy as the new year moved in. But there was at least one glimmer of hope—the decline in the cost of living index for the first time in eight months. The index is expected to remain at about the December level for the first few months of 1954.

Unions, aware that the index might furnish little help in obtaining wage boosts from now on, are seeking to move away from escalator clauses that tied wage patterns to the movement of living cost. A major railroad union was first to abolish the escalator. Look for others to follow.

► What Else—That was the first indicator for the new year. What are the others?

• Major propaganda campaign will be for the guaranteed annual wage. Make no mistake, the unions are worried about increasing unemployment. They see GAW as the way to stem the tide. It will be tested at the bargaining table in only a few industries at first, the steel workers leading the way. Win, lose or draw for the steel union, the Reuther-led auto workers renew the battle in mid-1955, when present contracts run out. The chemical industry will be spared the onslaught for at least a year, probably two.

• Higher wages and more fringe benefits will be the pitch again for the chemical unions—with the goal being to settle for the annual increase in productivity. Productivity has been increasing at the rate of about 3 percent per year—and bids to increase even faster as the use of automatic controls goes up. Tying wages to productivity is looked upon as a prime substitute for the escalator.

• Flat, across-the-board wage increases of recent years have cut substantially into the differential between skilled and unskilled worker. Labor leaders will try to remedy this by going for percentage hikes. The chemical industry, which requires highly skilled men, may well be hit hard by this demand.

 Bigger and better pensions are also on the agenda. One of the goals is a full vesting of pension rights in individual workers, so that if a worker changes jobs he takes his pension with him.

MANPOWER

- Still vexing management is the shortage of young engineers.
- Reductions in the nation's military needs may be some help.
- But more effective use of present staffs is the best remedy.

IN THE continuing problem of living with the shortage of engineers 1954 stacks up as another "period of adjustment." The demand is expected to continue unabated, while the supply of young, fresh-out-of-college men drops. With all the talk of shortage, however, there is evidence of a growing group of experienced engineers, the over-45's, who have found that even in a shortage there can be surplus.

Because of today's emphasis on learning and "growing with the company," the over-45 specialist often finds himself at a disadvantage when competing with the 25-year old for jobs. The 25-year old has two big advantages: he's more adaptable and will work for less.

- ▶ Unions More Active—All this portends an increase in the organizing activities of the engineering unions. Unionization of engineers has not been much of a problem to the chemical industry in the past. Sympathy for the union movement, however, is expected to come from the older engineer now in lesser demand. This, the unions hope, will eventually help reinforce their ranks and add volume to their voice.
- ▶ Demand—For the newly-graduated, the picture is completely different. The Engineering Manpower Commission of the Engineer's Joint Council estimates industry's yearly need will continue at between 30,000 and 40,000 engineers for a long time to come. All estimates of chemical engineer requirements run about 5,000 a year for at least another decade.

Indicative of the demand are the soaring salaries paid new graduates. June grads will launch their careers at a handsome \$355 per month average, with fledgling ChE's pulling from 10 to 15 percent higher—well

over the '53 average of \$350. ► Supply—How about the supply? The U. S. Office of Education estimates that some 23,000 engineers were graduated last year. For this year, the estimate is only 19,000—with 20,000 in 1955, just over 27,000 in '56, and the minimum goal of 30,000 in 1957. These estimates are based on freshman enrollments and normal "survival" rates.

For the next two or three years at least, industry recruiters will come away from the schools with less, often much less, than their quota.

► Military Drain Less—A bright spot is the prospect of an easing of the military drain on civilian manpower planned by the new Joint Chiefs of Staff. The new regime at the Pentagon hopes to cut the number of men in uniform some 400,000 between now and June 1955.

Last month, the Army began releasing many of its junior officers below captain—as much as three months before completion of their tour of duty. The result is the return of many of the ROTC men graduated in '51 and later, up to three months before expected. Thus far, this is only an Army policy, but the Navy and Marine Corps (not the Air Force) may follow suit.

The reduction of total strength for the military means:

- Decreased draft calls—instead of the 30,000 men per month anticipated for early 1954, calls will run about 18,000.
- Less pressure to call ROTC graduates for active duty. The Defense Department may permit ROTC men to serve the required time in reserve units.
- No call-up of other reservists, both officer and enlisted.
- ▶ Better Utilization—The over-all

picture of the engineering manpower situation is much the same as last year. All up and down the line, however, the trend is toward a better use of present staffs. Increased use of the technologist is a sign of the times.

The goal is to change today's ratio of one technician to every two engineers to a more realistic 5 to 1. As the personnel manager of one forward-looking company puts it, "We've got to live with this shortage. It only makes sense to back up the men we have—we get more mileage that wav."

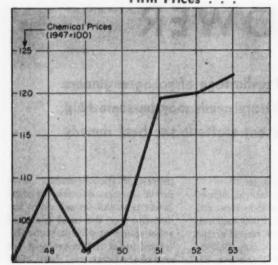
► In the Schools—In an effort to get more engineers, by getting more students to study engineering in college, industry is taking a hard look at the secondary schools.

In a paper delivered to the AIChE, Sidney Steele, director of the planning staff at Atlas Powder declared: "The kind of person coming into industry during the last 15 to 20 years has been changing. Two unrelated trends are noticeable—one in the direction of declining scholarship, the other in the direction of increasing specialization. There is a growing body of opinion that the decline in scholarship starts with a watering-down of public school curricula and standards.

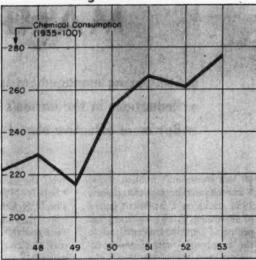
"It is no longer common practice to turn out high school graduates that have an adequate working knowledge of spelling, arithmetic, English, grammar, geography and history."

Since engineering and science courses are looked upon as "too hard" by those not accustomed to study, or who simply "don't know how," look for industry to voice a demand for upgrading secondary school curricula and standards as part of a long-range plan to increase engineering college enrollments.

31st Annual Review Issue . . . Firm Prices



High Demand .



Demand Is Up, Supply Keeps Pace

Firm prices and high demand combined to give suppliers of chemicals their best year in history. Dip in consumption seen this year, but not frightening.

Last year was a peak year for the chemical process industries. The value of output reached \$59 billion, 10 percent above 1952.

Consumption of chemicals increased about 5.5 percent in 1953. With the exception of fertilizers—farmers' incomes dropped sharply—nearly all end-use industries recorded gains over 1952. But consuming industries were beginning to cut back operations toward the end of the year. In turn, chemical producers have been feeling the pinch for the past few months.

Chemical prices firmed up in 1953. Industrial chemical prices averaged about 2 percent higher than in 1952 and prices of fats and oils rose about 6 percent.

► Looking Ahead—The McGraw-Hill Dept, of Economics has prepared a business outlook for the current year. Here's the way they see it.

Business has dropped off a little from the peak operations of the late spring and early summer of 1953. The outlook is for some further inching down during the balance of this year. But it's possible that business may get better before it gets worse.

Gross National Product — the market value of all goods and services produced in the nation—averaged \$368 billion last year. The current level (annual rate) is about \$366 billion. It's now expected that in each succeeding quarter of 1954, GNP will be lower than in the previous quarter.

Even so, GNP should average very close to \$360 billion this year, a decline of only a little more than 2 percent. That would make 1954 the second best year on record.

The Federal Reserve Board's index of industrial production, covering physical output of manufacturing and mining, averaged 134 (1947-1949=100) last year. An all-time peak was attained in May, June and July when the index hit 137. Since then output has fallen off to slightly less than 130, a 6 percent decline from the peak.

But this spring may see a mild recovery in total physical output because autos, steel, chemicals, petroleum refining and the appliance industry should be running ahead of early 1954 rates. By the third quarter of this year, however, the index of industrial production may drop as low as 120.

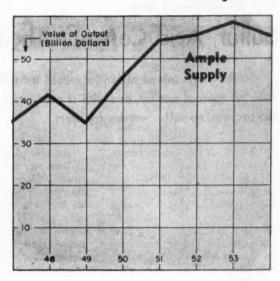
▶ Chemicals in 1954—What does this general business outlook mean to the chemical process industries? It means a decline in value of output by the industries to about \$56 billion from last year's record pace of more than \$59 billion. It suggests a decline in chemical consumption of about 5 percent. Further, it indicates some easing of prices of industrial chemicals. Here's a look at some of the most important segments.

On the happy side of the ledger, sulfur, pulp and paper, and chlorine and caustic had generally balanced supply and demand. Prices were firm and next year's picture is bright.

• Total sulfur consumption was up 3.9 percent—to 6.39 million long tons. Inventories dropped only slightly, indicating good supply. Demand for sulfuric acid was about 15.3 million short tons in 1953, as compared to 14.45 million the preceding year.

• For the first time in a decade, the supply of newsprint caught up with demand. And although there

New Record			1953 vs.
	1952	1953	1952
TOTAL	261.71	276.24	+5.6%
Fertilizers	59.89	58.40	-2.5
Pulp & Paper	28.56	30.75	+7.7
Glass	22.18	23.72	+6.9
Petroleum	25.79	27.34	+6.0
Paints & Varnishes	27.22	. 29.31	+7.7
Iron & Steel	14.37	17.33	+ 20.6
Rayon	27.26	28.82	+5.7
Textiles	10.50	10.51	+0.1
Coal Products	9.96	11.76	+18.1
Leather	4.23	4.26	+0.7
Industrial Explosives .	8.66	9,13	+5.4
Rubber	6.01	6.39	+6.3
Plastics	17.08	18.52	+8.4



was a marked upturn in paper and paperboard inventories in the first half of the year, a big surge in demand reversed this trend in the fourth quarter. Prices were firm and are expected to hold.

• Although there was some idle chlorine-caustic capacity due to overexpansion, production of these products jumped 8 percent—to a record high of 2.8 million tons. In July, chlorine prices were boosted from \$54 to \$58.60/ton in single unit tank cars and the industry should be running at capacity by the end of next year.

▶ Not Quite So Sound—Several of the chemical process industries had their problems last year. Oil, for instance, enjoyed a 6 percent rise in demand and expects 4 percent more this year. Yet, there is a serious oversupply problem and over 14 percent excess capacity.

• In resins and plastics, vinyl chloride production was up, but growth of film sales was hampered by chaotic prices. Urea and melamine adhesives were slow due to slump in the furniture industry. Polyethylene was scarce all year. However, demand for polystyrene molding powders rose rapidly, from 248 to 300 million ib.

• The fats and oils picture is mixed. Demand was generally on the downgrade last year, as were prices. For 1954, tallow and grease production should remain at the record 1953 level of 2.55 billion

lb., while lard and edible fats are expected to decline from the 8.8 billion lb. made in 1953.

• Total U. S. drug sales at the manufacturers' level rose from \$1.46 to 1.51 billion last year, will probably reach \$1.7 billion in 1954. But competition is stiff. Foreign manufacturers want in on the big U. S. market and frozen foreign currencies are forcing U. S. firms to build plants outside this country. Expect lower profits this year.

• Most petrochemicals are in good supply and demand is holding firm—so far. But there are signs of weakness. There will probably be some surplus benzene soon due to overexpansion and toluene may be in the same fix if the government cuts back on purchases as expected. Also, recent sharp price cuts for ethylene glycol and acrylonitrile indicate oversupply.

• Coal chemicals had some oversupply, too. Although total demand for the year was up substantially, most products passed through a peak early in the year and then experienced gradual softening. Producers of naphthalene, ammonium sulfate and pyridine, among others, were forced to cut prices. Consumption this year should be about 5 percent below 1953.

• Look for definite overcapacity soon in the alcohol and solvents field. Consumption was up last year, except for synthetic methanol, but there are a lot of new plants coming along that may have a hard time finding markets.

▶ Tales of Woe—Some segments of the industry won't look back on last year with smiles. Probably the worst hit were the noncellulosic synthetic fibers, except nylon. Practically no plants are running near capacity and the only significant expansion was in nylon. Big problem here is that wool prices dropped so sharply that fibers like acrylics can no longer compete. There were big price cuts on acrylics early this year and more are expected.

• Fertilizer sales were off nearly 3 percent and that may be just the beginning. In the meantime, capacity continued to increase rapidly and unless farmers start buying again, there will be a serious surplus of capacity. A hopeful note for some producers was the 21 percent rise in sales for concentrated superphosphate — to 470 thousand short tons. At the same time, sales of normal super dropped to 1.61 million short tons—down over 9 percent.

• Agricultural chemicals found 1953 marked by low prices—down to about 56 percent of the 1948 level—and poor profits. This year doesn't look quite so bad, though. Prices should edge upwards and be firm. Also, inventories have been brought almost to rock bottom and there shouldn't be much idle capacity in 1954.

Sulfur, Acid Continue Their Rise

Although mined sulfur decreased a trifle, total sulfur from all sources was up, and with it production of acid. For the present, no sulfur worries for users.

SULFUR-at the higher prices es-tablished during the past year (\$25.50-\$27.50 fob. mines)-now seems to be in ample supply. The sulfur famine of 1951 is a matter of evil memory only. For the pressent there is little chance of a shortage while new Frasch mines come in, and old ones hold up. One such new mine-its Garden Island Bay property, was started up by Freeport Sulphur Co. in November 1953. Projected capacity is 500,000 long tons per year. In the same month Standard Sulphur Co.'s little mine at Damon Mound, Tex., also went into production. To offset low reserves the company is using portable equipment.

Four new plants producing sulfur from sour natural gas came in during 1953, plus two more operating on sour refinery gases. At least one smelter increased its byproduct acid recovery potential, and two additional acid plants using H₂S as part of their sulfur supply went into operation.

► Optimism Rules—Various indicators showed the state of optimism of sulfur producers and users. In the spring the International Materials Conference ended its sulfur allocations, followed closely by the Office of International Trade. The rash of plans for new plants to recover sulfur from H₂S tapered off so that total capacity is likely to

peak (when all plants now building are completed) at under 600,000 long tons of sulfur per year. Nothing more has been heard recently about such long chances as sulfur from gypsum for the U.S. Until total demand from U.S. sources goes above 7,000,000 long tons per year, the situation should be well in hand.

▶ Sulfur-Acid Balance-Our estimates tabulating the U.S. sulfur and sulfuric acid balances for 1952 and 1953 give a rather complete statistical picture of what has been occurring. New Frasch-mine properties came in too late in the year to affect the mined sulfur appreciably. Meanwhile, recovery became increasingly difficult at one large mine so that its operator drew from stocks to offset a small overall decrease in Frasch-mine production for the year. The reduction was not quite offset by increase in sulfur shipped by sour-gas processors. But a sizable quantity of Frasch sulfur had gone to stocks in 1952 so that total sulfur shipments were able to

U.S. Sulfur Balance, 1952-		U.S. Sulfuric Acid Balan	Backback ADDRESS CONTRACTOR	
(Estimated, Thousands of Long Tons,	Sulfur Equivalent)	(Estimated, Thousands of Short T	1952	ent Acid)
	952 1953		(Revised)	(Preliminary
	vised) (Preliminary)	Sources		
Sources, Brimstone and Sour Gas		Sulfur	9.325	10.215
	,293 5,155	Pyrites		1,580
	,069 3,000	Smeller gases		875
	231 -70	Sour gases and sludge to acid		530
	,062 5,200			13,200
Sulfur produced from H.S	248 345	Total new acid		
Producers' year-end stocks	95	Estimated recycled acid	2,106	2,330
The state of the s	+19 +10	Total acid available	14,450	15,530
Approx. H ₂ S sulfur shipped	229 335	Disposition	200	
Low-grade sulfur are used	10	Fertilizer materials		
Total apparent sulfur sales 5	.291 5,545	Superphosphate	4.150	4.050
Sources, Pyrites, Gases, Sludge	Carrier State Control	Ammonium sulfate		1,200
Imported pyrites	133 90	Chemicals		4,180
Domestic pyrites	397 405	Petroleum refining	E00000ad_b=0-00a00000000	1.720
Smelter gases	267 270	Paints and pigments		1.370
Sour gases and sludge to acid	132 165	Rayon and film		760
		Iron and steel		1,160
Total sulfur in alternates	939 930	Other metallurgical		220
Tetal available sulfur 6	.220 6.475	Industrial explosives		420
		Textile finishing		40
Disposition	.304 1.250	Miscellaneous		410
To experts	,304			00000000000000000000000000000000000000
	980 1,010	Acid totals	14,450	15,530
	TO THE OWNER WAS A STATE OF THE OWNER.			
Pyrites	136 145	Principal Non-Acid Uses	of Sulface	and Burita
	130	(Estimated, Thousands of Long To		
To acid Sulfur	871 3.140	(Estimated, Indusanas of Long To	1952	1953
	April 400-0000000000000000000000000000000000		1732	1933 (Proliminary)
Alternates		Disposition		тентинату
Acid total	,800 4,060	Wood pulp	380	390
Total disposition	220 6.475	Carbon bisuit 'e	200	220
fincludes an estimated 10,000 tens of sulf		Other chemicals, dyes	200 0 00 000000000000000000000000000000	95
n making sulfite llaver.	by education in bigger and	Insecticides, fungicides	ACCOUNTS AND DOUGH	100
Pincludes spont acid used as such, in conc	entration and refertification,	Rubber	75	80
livege ocid burned in sludge-recovery plants				135
fincludes estimated total acid going into		Other	130	60 PER 1997
nly! About two-thirds goes later into recycl	e ecid.	Totals	980	1,020

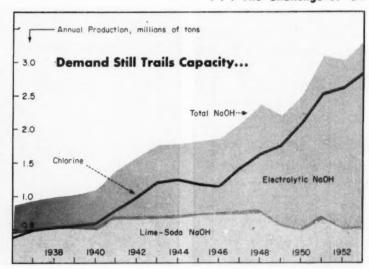
advance more than 5 percent compared with the earlier year.

Equivalent sulfur content of pyrites and gases used during 1953 decreased very slightly below 1952 owing to the Canadian pyritesmine strike. Consumption of domestic pyrites for acid is believed not to have changed appreciably. However, one new use for pyrites came into the picture-the Brown Co.'s fluidized roaster which turned out the estimated equivalent of some 10,000 long tons of sulfur for making sulfite liquor. A second fluidized roaster went into operation at Yerington, Nev., but this one operated on low-grade (30 percent) sulfur ores which are burned to SO2 for a new contact acid plant producing acid for Anaconda's copper leaching. The Yerington operation commenced late in the year and recovered no more than an estimated 10,000 tons equivalent.

► Sulfur's Destination—Where this total sulfur equivalent went is also indicated by the table. The pattern is substantially similar to that of 1952. Exports decreased slightly and totaled about 19.3 percent of all sulfur equivalent available. Non-acid uses, estimated at 1.02 million tons, remained at 16 percent of the total. Acid requirements took some 4.06 million tons, or 63 percent of the total.

As usual, the great bulk of all the new acid produced (estimated at 13.2 million short tons 100 percent, or 7 percent over 1952), came from brimstone. Nearly 78 percent was brimstone acid, with 12 percent from pyrites, 6.5 percent from smelter gases, 1.5 percent from H.S., and 2.5 percent from sludge.

The acid consumption pattern is complicated by the difficulty of determining exactly how much acid was persuaded to do its work more than once by one of several methods of recycling. However, total acid use appears to be up about 7.5 percent, to 15.53 million tons. Most acid consuming industries increased their requirements during 1953, the only important exception being fertilizers which fell off about 3 percent, all in the latter part of the year. This was true in both the superphosphate and synthetic ammonium sulfate brackets.



Chlorine-Caustic Outlook Bright

Continued steady growth and improved balance in demand for both chlorine and caustic soda are expected to relieve present problem of overcapacity.

Expansion of electrolytic chlorine-caustic capacity for a possible shooting war has temporarily burdened the industry with idle facilities. Capacity is now some 20 percent more than present demand.

In spite of their impatience, however, industry spokesmen are optimistic about future prospects. Chlorine production in 1953, although lagging behind the rate at which new capacity came in, was at an all-time high, an estimated 2.8 million tons. This was 8 percent over 1952 figures. At this rate the industry should be operating at or near capacity by the end of next year.

▶ Cause for Optimism—Sleeper in the chlorine picture is titanium metal. If the military can get its wanted metal production underwritten, chlorine consumption for the intermediate tetrachloride may soar from 1953's 10,000 tons to a rate of 200,000 tons per year by the end of 1955.

Another cause for optimism is improved balance in the demands for caustic soda and chlorine in some producing areas. This does not seem to be due to special activity in any one caustic-consuming

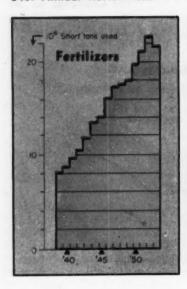
industry, but rather to a general firmness in demand.

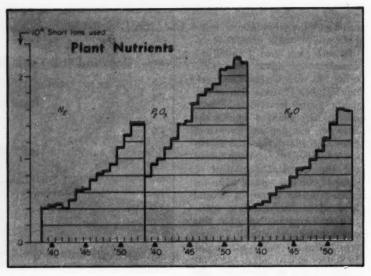
Gulf Coast producers, on the other hand, face a real problem in disposing of excess caustic. Consumers in that area take only 12 percent of the area's output; the rest must be shipped long distances into other distribution areas or disposed of in some manner, such as down-grading to soda ash or outright dumping.

► More Mercury Cells—On the technological front, the mercury cell is getting a real shakedown, with several new installations coming in last year.

After delays caused by inability to get materials of construction, especially nickel, work is nearing completion on Hercules' 35-ton-aday plant to make chlorine from byproduct HCl. The plant is expected to go on stream in May.

Continuous finishing of caustic soda in Dowtherm-heated evaporators, first introduced by Dow in 1946, is beginning to catch on elsewhere. Penn Salt put in a unit at Wyandotte last year, and work on five units is currently under way in France, Italy, Japan and Australia.





Farm Slump Touches Fertilizers

Farm income fell off in 1953 and farmers are worried. Fertilizer output followed, with about a 3 percent drop. But fertilizer chemical capacity still rises.

Fertilizers and fertilizer chemicals have just come through a mixed and somewhat confusing year. The fertilizer year 1952-53, which ended June 30, 1953, was probably a record-tonnage up some 3 percent and nutrients up perhaps 8 percent, according to National Fertilizer Assn. But the calendar year picture wasn't quite so goodin fact, was something like 3 percent off from the previous calendar year. 1953 was a year of widespread droughts, coupled with falling prices for agricultural products. The farmer's crop income was about equal to that of 1952, but his total income was 4 percent less. ► Tonnage Is Off-Commercial fertilizer sales for the calendar year 1953 seem to have declined about 3 percent from the 1952 peak of 22.7 million tons, to about 21.5 million. The plant nutrient content is currently somewhere between 23 and 24 percent, with the 1953 nutrients totaling about 5.15 million tons, coasisting of 1.43 million tons of N_s, 2.15 million tons of available P.O., and 1.57 million tons of K.O.

These slight decreases came in

the face of increasing capacity all along the line. The increase in synthetic nitrogen capacity set by NPA is ahead of schedule-about 2,500,-000 tons today against the 2,920,-000 goal set for 1955. Present construction and plans may hike total synthetic capacity as high as 3.2 million-and ammonia makers are already worrying about a surplus. 1953 ammonia output was in the neighborhood of 2,290,000 tons, 11 percent over 1952, while ammonium nitrate reached some 1,550,000 tons of which all but about 200,000 tons went to agriculture. This was 28 percent up.

Ammonium sulfate presented a different picture. Byproduct sulfate at coke plants increased by 20 percent compared with the steel-strike year of 1952, but large imports forced the synthetic product into a decline of some 250,000 tons (31 percent), compared with the 813,000 tons of 1952, an over-all 6 percent reduction.

▶ Phosphates Fall—Superphosphate production was at a high level earlier in 1953 but decreased toward the end. This decrease was in the normal grade—about 9 percent. The

concentrated grade continued its recent sharp increase, winding up the year about 21 percent ahead of 1952. Total reduction in available P₂O₈ was about 3 percent. The trend toward the concentrated product is reflected in a 13 percent increase in wet-process phosphoric acid made during the year. Meanwhile, total agricultural phosphate capacity was up about 10 percent, but the 1953/54 capacity estimated by USDA at 2,667,000 tons lags considerably behind the 1955 goal of 3,485,000 tons.

Domestic potash production seems to have increased about 10 percent over 1952, with imports off, and total shipments about equal to 1952. Estimated U.S. consumption included about 1,570,000 tons used by agriculture and 100,000 tons by chemicals.

In general, the trends of recent years have continued. Interest continues in nitrophosphates, in improved methods of ammoniation and more concentrated products, in granulation, continuous processing, and in direct application of ammonia to soils. The last, in fact, demonstrated about a 50 percent increase in the last year.

Nitrogen Production*

(Million tons N2) Cal. Year Coke oven Synthetic	1949	1953	1954
	0.21	0.27	0.3
	1.54	2.26	2.5†
Total	1.75	2.53	2.8

* Chem. Eng.-Chem. Week estimates. † For 1954 estimate synthetic capacity as 1.8 for agriculture. 0.5 for industry and 0.1-0.2 available for military uses.



Paper Eyes Cellulose Supply

Record production highlights importance of a continuing fiber supply. Increased use of fibrous waste and hardwoods strengthens position to meet future demands.

Output of paper and paperboard reached a new record peak in 1953. At the same time the industry was making moves that will provide strength to meet future demands.

By year's end U. S. mills had spewed forth an estimated 26,500,000 tons of paper and paperboard. This was a crunching advance of 2,100,000 tons over 1952's production and a comfortable 500,000 ton lead on 1951's record.

Pulping facilities turned out a new high of 17,823,000 tons for an impressive increase over 1952's 16,464,233 tons. With U. S. production reaching this peak North America became essentially self sufficient in pulp.

Consumption during the past year is estimated in excess of 31,000,000 tons including 4,885,000 tons of newsprint from Canada.

▶ Which Way Newsprint?—World stocks of newsprint became adequate to satisfy demand for the first time in a decade. Yet opinion in this country was sharply divided on the future course for this commodity. We only produced a total of 1,080,000 tons contrasted with the 4,885,000 tons from Canada.

Political forces, prodded by newsprint consumers, are strong for an expanded newsprint industry in the U. S. They reason shortages have been too chronic and prices too high. Yet in the face of a balanced world supply and demand such an approach seems unrealistic. It would seriously curtail the healthy trade relations between the U. S. and Canada.

Future outlook for pulp and paper is bolstered by plans for new and improved products and better profit margins; new technology and raw material supply.

with More Profits—On the sales end there is feeling that new products with a wide range of uses are needed to widen profit margins. This approach paid off during periods of tight profits in the past. A more comprehensive evaluation aims at minimizing non-productive outlays from manufacturing through all steps to final delivery of product.

► Tapping New Sources—An important move has been made toward strengthening the raw material supply situation. With present high output there is a heavy drain

on existing stands of soft pulpwood. To counteract this condition there has been a surge of activity in pulping hardwood, agricultural waste and wastewood.

Until fairly recently use of shortfibered hardwood was confined to production of corrugating medium. Now hardwood pulp is going into higher grade papers.

During the past year West Virginia Pulp & Paper Co., Mechanic-ville, N. Y., completed a \$7 million switchover to use of local hard pulpwood. Using a neutral sulfite semi-chemical process this mill makes pulp which it then uses in bristol board, book and envelope papers. Color is comparable to paper from softwood pulp; strength equals spruce-base paper.

On the West Coast Weyerhaeuser now has a mill operating entirely on sawmill waste.

And in the South, Valentine Pulp & Paper Co. was due to start a newsprint-from-sugar-cane-bagasse mill late in 1953. Located in the Louisiana sugar-producing country this 50-ton-per-day mill is expected to give 50 percent pulp yield using a "light touch" process.

Lignin gained new stature with announcement that Marathon Corp. now buys waste sulfite liquor in order to keep up with demand for its lignin derivatives. And West Virginia Pulp & Paper formed a polychemical division to push marketing of lignin products. But the most startling news is that University of Washington chemists have shown sulfonated lignins to have heparin-like anticoagulant activity. Thus a fertile new source of potential anticoagulant drugs opens up.

► More Probing—Despite all this activity and evidence of progress there is a healthy sign of critical self-appraisal abroad in the indus-Speaking before the 38th annual meeting of TAPPI in New York, Allen Abrams, vice president of Marathon Corp. pointed to need for greatly expanded research activity. Even the leading companies with good research staffs spend no more than an average of 0.7c. out of each sales dollar on research. By contrast the chemical industry as a whole spends about 2.5 to 3c. out of each sales dollar.

Petro-Xylene in the Aromatics Spotlight

Isomer separation opens new chemical uses for petroleum-derived xylenes. Some soft spots are developing in other petrochemicals, but optimism prevails.

Xylenes are beginning to step out of their traditional role as solvents into a new role—that of basic petrochemicals.

As is true with many basic chemicals today, the xylenes' new look is closely related to developments in synthetic films and fibers. Paraxylene, whose output is being greatly expanded this year, is the precursor of terephthalic acid, essential intermediate for Du Pont's Dacron polyester fiber and Mylar polyester film. Meta-xylene is used to make isophthalic acid (or its esters) for surface coatings and polyester resins.

► Ortho Was First—Since 1945 Oronite Chemical has been isolating ortho-xylene and making phthalic anhydride from it. When Dacron was nearing commercialization a few years ago, Du Pont logically looked to Oronite for paraxylene to supply its projected dimethyl terephthalate plant at Gibbstown, N. J. But it's a long haul from California to New Jersey, so Humble Oil came into the picture last year with a 25-million lb. per year plant at Baytown, Tex.

Phillips and Standard of Indiana are jumping on the para bandwagon with new plants. And Sun Oil, with its new aromatics unit at Marcus Hook, Pa., just across the Delaware from Gibbstown, is in an ideal spot to turn out para-xylene.

So far, only Hercules and Oronite have gone into the meta-iso field. Hercules is operating a pilot plant for dimethyl isophthalate (and terephthalate); Oronite's plans call for construction of a \$10-million, 50-million-lb. isophthalic acid plant this year.

▶ Benzene, Toluene, Phenol — Enough catalytic reforming units are now on stream to help cokeoven operators and tar distillers meet current benzene demands. In fact, there may be temporary or local oversupplies of benzene.

Toluene comes from these reforming units, too, in even greater quantities than benzene, but most of it is being taken by the military for TNT and aviation gasoline. If military demands fall off very much, toluene will be seeking markets. The refiners' alternative is to swing over to production of high-octane blending stocks instead of aromatics.

Petroleum-based phenol became a commercial reality in 1953 with the opening of B.A.-Shawinigan's new plant at Montreal East, Canada. Cumene (isopropyl benzene)

Oil Boom Continues Despite Rising Inventories

Demand is up, so are profits. And current oversupply situation, although serious, should lighten this year. Look for a big fight in Congress on imports question.

Refiners and producers of petroleum enjoyed another record year in 1953. Domestic demand rose to an estimated 7,721,000 barrels per day-up 6 percent over 1952—capital expenditures hit over \$4 billion and crude oil producers managed to raise their prices — 25c./bbl.—for the first time since 1947.

About the only flies in the ointment were steadily increasing overcapacity and oversupply. Most recent PAD expansion goals call for a refining capacity of 8.5 million bpd. by the end of this year, 9 million by the end of 1956. With crude runs to stills expected to

average only a little more than 7 million bpd. in 1954, that's going to leave an awful lot of idle equipment which owners will be tempted to put into service.

▶ Reductions Needed—Such a move would, of course, add to the already critical problem of oversupply. Total inventories in November were up 67 million barrels over the comparable period in 1952. Since then stocks have continued to rise, but at a somewhat slower rate. And domestic crude oil production is expected to go from 6,487,000 to 6,556,000 bpd. this year, with imports jumping 5 percent — to 1,096,000 bpd.

Several possible solutions have been proposed, but the one that seems to make the most sense is voluntary cutbacks all the way down the line: state allowables, production and refinery runs. This would mean living with even more idle capacity, but it would also mean little or no government intervention into the crisis. Small refiners, in particular, favor this policy and moves have already been planned in this direction.

► Controversy — The smaller domestic refiners and producers — and some of the larger ones, too—also favor a curb on imports, preferably through voluntary cutbacks, but by higher tariffs, if necessary. The reasoning here is that less foreign oil will substantially alleviate oversupply. If something isn't done soon, these companies argue, investment capital

is oxidized and split to yield phenol and acctone.

▶ Ethylene vs. Acetylene—Ethylene is still the dominant two-carbon petrochemical raw material, in spite of recent threats from acetylene. Last year saw the start-up of two large ethylene units, Gulf and National Petro-Chem. Gulf is said to be planning another, so great is the ethylene demand in the Port Arthur, Tex., area.

Petrochemical acetylene is due for a boost this year, however, when American Cyanamid brings in a plant at Avondale, La., for making acetylene from methane. ► Soft Spots—Although producers of petrochemicals are still spending expansion money at a fast clip, there are signs that the pace is due to slow down. Prices have recently been cut for two of the "boom" chemicals, ethylene glycol and acrylonitrile, in spite of-or because of -the fact that they both are intermediates in the production of synthetic resins and fibers. The recent start-up of National Pet's huge ethyl alcohol plant is bound to be felt in the marketplace.

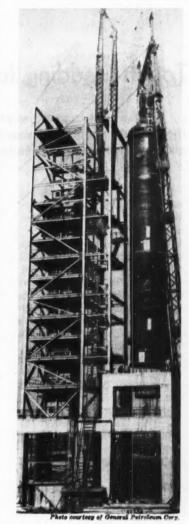
► Future Threats—Looking some distance into the future, three developments not yet commercially successful may have far-reaching effects on petrochemicals:

 If Stanolind (or some other operator) can put the Brownsville Fischer-Tropsch plant on its feet, a virtual flood of oxygenated aliphatic chemicals will descend on the market.

• Du Pont's new coal gasification process (see p. 114), if successful, will threaten the leading position of natural gas in the ammoniamethanol picture. Rising gas prices will favor the swing back to coal.

 And coal hydrogenation may eventually take some of the aromatics business away from hydrocarbon reforming.

Nonetheless, petrochemical people are still bullish. They regard competition from coal and Fischer-Tropsch lightly, feeling that petroleum and natural gas supplies are still too healthy for concern. Chief worry in petrochemical circles, rather, is internal competition, both among producers and products.



Tripling of cat reforming capacity this year will boost output of highoctane fuels and petro-aromatics.

will tend to move away from domestic oil exploration and the industry will be permanently hurt.

Aligned against these ideas are most of the big companies that have both foreign and domestic crude sources. They claim that warm weather and a slight business decline are as much to blame as imports for the high stocks and that in the event of war, we would badly need outside petroleum sources. Even more strongly, they feel that even if oil imports should hurt the domestic industry, it would be far better for industry to work out the solution than for government to step in.

Both these groups have powerful backing in Congress, and when the whole question of tariffs and imports comes up in the current session, you can expect oil to be right in the middle of the battle.

What's Ahead—Despite a certain amount of pessimism, the outlook for this year and beyond is bright. Whereas most segments of the

chemical process industries will experience slight declines, the oil industry expects total demand to jump to 8.34 million barrels daily, including 310,000 barrels to export. While this rise is only 4 percent over 1953, as compared to an average annual rise of 6 percent for the past 20 years, it's hardly a gloomy prospect.

Capital expenditures, too, are expected to remain high. Some 49,000 wells were drilled last year. This rate will be met and probably bettered in 1954. More wells mean more refining capacity, more transportation and more marketing expenditures, so it's hard to see how the industry can drop its total spending much below last year's rate.

► Surge in Reforming – Catalytic reforming capacity – 10 different processes—will triple this year. As 1953 closed, there were 43 units on stream, with a total capacity of 200,000 bpd. By the end of this year, there should be 94 completed

units, having a total throughput of 635,000 bpd.

Cat reformers, like catalytic crackers, are getting bigger. The average charge for those units on stream now is 4,650 bpd; new ones will average 8,500 bpd.

Aviation alkylate projects also boomed last year. Sixteen companies have at least 21 new plants under way and PAD has stopped pressing refiners to install new facilities. Actually, there seems to be some oversupply, but it's expected that output and consumption will be pretty well in balance by midyear, with some alkylate being diverted into motor gasoline.

Tough Sledding for Solvents

The most competitive year in over a decade—that's the '54 outlook for alcohol and solvents. Industry's job: a good hard look at production facilities.

Alcohol and solvents face one of the most competitive years since 1940. More price reductions seem inevitable.

The beginning of 1954 will see an operating capacity of 215 to 220 million gallons of synthetic alcohol. Add this to the minimum amount of fermentation alcohol and you have an excess of nearly 10 million gallons. This is the problem facing producers unless they are forced to curtail production.

If economists' predictions are correct, business will be off about 5 percent in '54. Since alcohol consumption follows the over-all industrial economy, it would be reduced by the same figure. This would increase the alcohol surplus by another 10 million gallons.

Over the years, alcohols and solvents have reached their saturation point. With the exception of the growth factor, overall demand will not vary more than 10 percent either way.

In two or three years, production curtailment will be necessary to avoid complete price demoralization. Balance between supply and demand should return with the growth of the country and its technological developments. Reappraisal of alcohol and solvent production facilities faces the industry in the immediate future.

► Ethyl Unsettled—Ethyl consumption for the year was 238 million gallons as compared with 230 million for 1952.

At the year's start, the market was unsettled. Several producers had troublesome inventories.

In mid-January, Rubber Reserve's schedule for GR-S production called for more butadiene than was available from petroleum plants. Therefore they sent out a tender for 15 million gallons of alcohol to operate alcohol-butadiene plants. Deliveries against this bid reduced alcohol inventories. Another tender for 20 million gallons was issued in March.

Meanwhile, Cuba cut the sugar crop; molasses market was relatively firm. These two forces firmed the alcohol market; prices went up 8 cents per gal. during the second quarter.

By July, a sufficient stockpile of synthetic rubber was created and Rubber Reserve announced a cutback in GR-S production. With butadiene from alcohol marginal, the supply became easier as plants shut down.

During the last quarter of '53
two new large synthetic alcohol
plants neared completion. Their
potential production: an additional
40 million gallons of ethyl. This
new inroad forced a shift of some
large contract customers. And at
least one synthetic producer had to
look elsewhere for contract mar-
kets. Increased competition forced
ethyl's price down 5 cents per gal.,
leaving a net gain of 3 cents for the
year.
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31st Annual Review Issue .

At the end of the year there were sufficient inventories as well as evidence of weakened price structure.

The Future for Ethyl-Normal ethyl markets can be restored by at

least two factors:

• Distribution of ethyl alcohol has increased within the last five years to a point where transportation, storage and selling expenses account for at least 40 percent of the present selling price. A further dip may make it more economical to curtail production rather than sell at much lower prices. Balance between production and demand would be reached.

 The greater the demand for and value of ethylene (over ethyl alcohol), the more it will be shunted away from alcohol.

Other considerations that will affect the near-future picture:

 Increase in the value of molasses in cattle feeds reduces its use in alcohol production.

• During 1954, the pattern for disposing of synthetic rubber plants will be set. If synthetic rubber demands increase, as predicted, there won't be enough petroleum butadiene to take care of the demand. This might mean that butadiene price from raw price alcohol would be cheaper than that coming from new plants.

► Methanol Firm—Synthetic methanol output for 1953 was about 160 million gallons. That's a drop of about 6 million gallons over 1952.

Due to another open winter, anti-freeze (consuming about 30 percent) went down, unsettling methanol's price structure.

Petroleum challenged methanol's hold in the field of production and inhibition of formaldehyde (consumption: 45 percent).

The overall picture, however,

PRODUCTION of the Big 3 Alcohols			
	Ethyl Alcohol	Syn. Methyl Alcohol (Millions of Gallons	Alcohol
1953	238	160	162
1952	230	166	141
1951	253	185	160
1950	203	136	145
1949	169	127	115
1948	171	150	139
1947	166	84	113
1946	150	77	79
1945	428	75	82
1944	586	72	80
1943	438	65	63

. . . The Challenge of '54

showed continued industrial demand for methanol and its price held firm. Overproduction is predicted for 1954.

► Continuous Isopropyl—The year's isopropyl production, estimated at 162 million gallons, was up 21 million over 1952.

With textiles in a continued slump, less acetone was consumed. Since over 50 percent of isopropyl goes into acetone production, this released more alcohol for the open market.

New use for isopropyl in the automotive industry, however, offset the volume lost in the anti-freeze and textile markets. If this trend increases, producers may abandon marginal areas to ethyl and concentrate on the new outlet. This would firm both isopropyl and ethyl.

Ketones Hold Their Own—The acetone market continued to be spotty most of the year due to the textile decline. Although prices were firm, shading was prevalent on some governmental bids. If automotive demand for isopropyl continues, enough alcohol would be consumed to offset what looks like a permanent loss of over 20 percent in the acetone market.

For the first time since 1941, production of methyl ethyl ketone topped demand. A large part went into automotive finishes and vinyl resin solvents. Present ketone facilities seem adequate for the next few years.

Methyl isobutyl ketone continued to be in good demand as a nitrocellulose solvent and for vinyl resins. Production has increased in the past few years.

► High Alcohols and Esters—Like methyl isobutyl ketone, demand and price structure for normal butyl alcohol and acetate was constant for the year.

Demands for secondary butyl and acetate were nominal. Their sole manufacturer seemed satisfied to offer them as service items.

The two major producers of isobutyl alcohol and acetate engaged in cut-throat competition most of the year. They managed to reduce prices without materially increasing their volume.

Synthetic amyl production was normal. Supply was somewhat easier by the year's end.

Coal Chemicals Nurse New Ideas

Still in infancy but coming. That's the outlook for coal hydrogenation, low temperature carbonization and gasification. Many feel it's the start of a bright future.

Coal chemicals are keystones in today's structure of synthetic materials. On that there's no argument. For tomorrow there is an unknown but promising future that has begun to catch all imaginations.

Our present position was defined recently by Carbide and Carbon's President Davidson, "We are today, with respect to the production of aromatic chemicals from coal, just about where we were with respect to aliphatic chemicals from gas and oil 20 years ago." Many other experts also feel that great developments, based on coal, are in the making.

▶ Action for Future—Such thinking is having its effect on future plans. Replies to McGraw-Hill's sixth annual survey of large business firms (conducted this past year) show chemical firms' expansion plans up to 1956 are twice those for all U.S. industry. Foremost among new products and processes expected to call for the largest outlays is coal hydrogenation—which could reach the stage where it would need large capital investment.

Close behind coal hydrogenation in current interest comes low temperature carbonization. A 50ton pilot plant for carbonizing bituminous coals has been reported in successful operation by Pittsburgh Consolidation Coal Co. since February 1953. It's said to be a fluidized bed operation. Chemical yield tops that of byproduct coking by a wide margin; residual char is good fuel. Basic gain: higher dollar yield per ton of raw coal.

There's other progress of note that counters the trend toward natural gas in producing synthesis gas. Du Pont's Belle works has been installing a one-step process that bypasses coke ovens and gas generators. Coal is converted more completely; pollution is less.

Low-fusion-ash coal replaces the less abundant coking variety. It's pulverized and burned at carefully controlled temperature with a deficiency of oxygen in the presence of steam. Combustion product is a synthesis-gas mixture of carbon monoxide and hydrogen.

Market Telltales — Day-by-day

progress of coal chemicals is charted by the interplay of supply and demand in the market place. And 1953 produced some interesting squiggles on the chart.

It was a year that saw coke oven capacity increased over 2,000,000

NO STRIKES, Good Output of Coal Chemicals

	1951	1952	1953
	(Millions of Tons, Pounds or Gallo		
Coke, tons	79.3	63.5	73.5
Breeze, tons	5.2	4.5	5.0
Ammonium sulfate, Ib	1,788	1,608	1,920
Ammonia liquor, lb	49.6	44.0	50.0
Crude coal tar, gal	795.3	700.0	825.0
Creosote oil, gel	33.3	40.0	40.0
Crude nephthalene, Ib.		*****	120
Benzene, gal	177.4	155.0	180.0
Toluene, gal	34.3	30	35
Xylene, gal	9		9
Solvent naphtha, gal	5.8	5	6
Refined pyridine, lb	1.5	1.2	1.4

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tons. Available capacity rose to 73,239,540 net tons annually.

Output was high aided by increased capacity and freedom from strikes.

Early in the year demand was strong, supply short and prices on the rise. Overabundant naphthalene was one exception.

In April benzene was bringing 36-42c./lb. with petrobenzene going for 55-60c./lb. During summer months there was a flurry of price boosts. Ammonium sulfate contracts for the '53-'54 season were being written at about the same prices as the previous season.

By fall there was a definite slow-down. Ammonium sulfate and naphthalene sales were bucking a market sated by lower cost imports. Sulfate price cuts failed to stimulate sales. Production finally was cut back in November. By December naphthalene had suffered its first price cut since 1950.

Mid-summer found refined 2 deg. pyridine readily available; mid-autumn found it moving very slowly. Then in December price finally fell from \$1.15 to 95c./lb.

Benzene, the big chief of coal chemicals, seemed slowing for a breather by December. Some producers were building inventorics and prices were wavering.

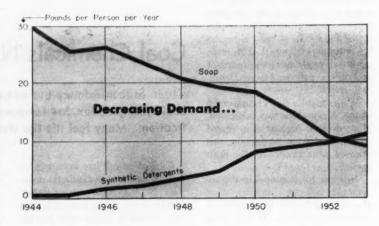
Government toluene buying is due for gradual cutbacks starting early in the new year. This will mean temporary oversupply on the civilian market.

▶ More Rather Than Less—Looking ahead there is much that is encouraging. Consider benzene as an example. According to the recently released BDSA end-use pattern for 1950-52 about 50 percent of benzene production was consumed in making phenol and styrene. The remainder was gobbled by materials such as aniline, maleic anhydride, DDT, syndets, BHC.

Phenol outlets are surging upward.

Maleic anhydride, another benzene derivative, is on the brink of a soaring demand. Touch-off spark may come from an eye-popping expansion in use of polyester resins which contain 22 to 25 percent maleic anhydride.

These and new products still to come are reason enough for the bullish outlook ahead.



In Fats and Oils The Shift Is

This year stacks up as a period of reappraisal and readjustment for the fats and oils industry. Though 1953's production of both edible and inedible fats and oils slipped below the marks of the previous year, large supplies were available. The abundant supply, coupled with the inroads which synthetic detergents are making in the soap field, in spurring two industrywide trends.

 Greater use in foods, including animal feeds.

· Increased research activity to find more extensive non-food uses. ► Margarine Surge—Evidence of the first trend is found in the phenomenal surge of margarine. Consumption last year reached a peak of 8.1 lb. per person. On the other hand, butter consumption tobogganed to a new low of some 8.7 lb. per person. The butter-margarine price relationships favor increased margarine consumption. And, since 46 of the states have lifted restrictions on the manufacture and sale of colored margarine, 1954 may well be the year that margarine consumption' will slide past butter.

Soaps Down—That's what happened in the soap industry last year. Sales of synthetic detergents soared nearly 25 percent over the 1952 level, while soap sales were falling off almost 11 percent. Result: For the first time, synthetics are cred-

ited with the major portion of the market.

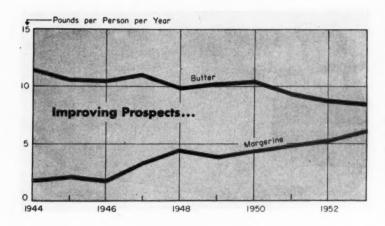
The feeling is that the synthetics will continue to claim a greater and greater share of the ever-expanding detergent market. While some synthetics contain fats, petroleum derivatives and coal-tar products account for the biggest percentage. Yearly use of fats and oils in synthetic detergents runs over 150 million pounds, however.

Tallows and greases are the major domestic soap fats. As production climbed, domestic requirements have dropped, freeing large quantities for export at low prices. Fortunately, postwar, world-wide shortages of fats presented a ready—and timely—market. However, the dollar shortage overseas is compounding the difficulties of foreign trade.

Development of new uses and new products appears to be the only workable solution to the tallow and grease disposal problem.

► Lard Comes Back—Indicative of the tack to be taken with the inedibles, is the recent history of lard. Advent of hydrogenated vegetable oil shortenings was a virtual death warrant for lard. A characteristic odor, poor stability and a tendency to smoke forced lard to take a backseat, while the vegetable oil shortenings walked away with the market.

Heads-up research work has



From Inedibles to Edibles

helped overcome these handicaps one by one and return lard to the competitive picture. Odor was removed, antioxidents added to prevent rancidity, hydrogenation and even molecular rearrangement have been used to conquer shortcomings.

This year will see the industry apply this thinking to other of its "problem children."

▶ New Outlets—The fall meeting of the American Oil Chemists Society devoted much of its attention to papers on the various aspects of the problem of slipping markets and prices. One potential outlet studied was the use of tallow and greases in animal feeds. Since fats are a significant source of calories (having 2.25 times the caloric value of carbohydrates) there are indications that a relatively small percentage incorporated into animal feed would be highly beneficial.

Attention is also being given to the chemical processing field. The long, straight-chain structure of the fatty acids are seen to present advantages in such fields as plastics, rubber, synthetic fibers, surfaceactive agents, lubricants and waxes.

New Developments—1953 saw three new developments announced by the U. S. Department of Agriculture.

 Peracetic oxidation. Cheap vegetable oils or animal fats are esterified, then oxidized with peracetic acid to yield vinyl plasticizers, greases and other products. (Chem. Eng., Aug. 1953, pp. 118-122.)

• Margarine compounding. For the armed forces, the USDA developed a margarine spreadable at -4 deg. F. and stable—even retaining its form—at 110 deg. F.

• Filtration-extraction process. This was a 150 ton/day plant for solvent extracting seed oils. Feature is a 98 percent yield of oils and a high grade meal.

Among other important developments of '53 was the perfection of impulse rendering. High-frequency mechanical impulses set-up by a modified hammer mill is used to render oils and fats. (Chem. Eng., Feb. 1953, pp. 118-122.)

Scheduled to go into operation this June, is the sodium reduction plant of Archer-Daniels-Midland at Ashtabula, Ohio. The new plant will produce higher alcohols of high purity by an improved sodium reduction process. Early in 1953, Stepan Chemical Co., Chicago, started up its 1.5 million lb./yr. semiworks to convert tallow to fatty acids by sodium reduction.

Another development of 1953 which will carry-over and influence 1954 is the rapid growth in con-

Production of Selected Oils and Fats-Thousands of Pounds*

	1950	1951	1952	1953†
Vegetable Oils				
Cottonseed erude	1,605,990	1.417.013	1,717,436	1.867,000
Peanut crude	145, 108	183,739	101,444	59,000
Corn erude	247.853	232,125	231,567	258,750
Soybean crude	2.074.702	2.472.838	2,478,046	2,503,200
Coconut crude	562,200	516, 162	434,562	422,000
Linseed raw	749.519	758,838	545,318	488,300
Castor crude /1	99,619	61,385	55,083	48,750
Castor crude #3	27,950	17.884	18,899	14,950
Other vegetable oil crude	78, 105	58,399	47,701	72,100
Animal Fate				
Lard rendered	2,294,000	2,531,000	2,612,000	2,145,000
Tallow edible	108,309	89,234	123,475	178,700
Tallow inedible	1,289,984	1,301,031	1,448,383	1,675,750
Grease other than wool	619.725	620,961	613,046	592,600
Fish Oils				
Cod and cod liver oil	1,221	1,466	1,508	1,100
Other liver oil	1,192	1,683	615	300
Menhaden	69,188	90,727	96,665	122,000
Sardine (Pilchard) and herring	82,999	20,044	8,261	4,600
Other fish oil except liver oil	12,216	13,130	13,708	8,000
Secondary Products				
Shortening	1,709,848	1,402,707	1,611,418	1,733,000
Oleomargarine	937,045	1,036,341	1,285,975	1,304,500
Chemically-dehydrated castor oil	49,948	22,438	16,037	17,000
Tall oil crude	309,802	398,237	312,769	318,800
Glycerin, crude (100 % basis)	225,512	211,348	187,902	217,700

Factory Consumption by Uses-Thousands of Pounds*

	1950	1951	1952	1953†
Edible Products				
Shortening	1,709,907	1,408,009	1,617,020	1,699,800
Oleomargarine	765,177	847,205	1,046,010	1,051,000
Other edible	734,015	700,651	761,426	867,000
Inedible Products				
Soap	1,887,879	1,617,141	1,458,105	1,377,500
Chemicals	138,396	121,055	140,268	140,800
Paint and varnish	600,578	571,220	551,252	552,800
Lubricants and greases	109.764	126,598	116,430	122,700
Linoleum and oil cloth	149,809	132,244	125,032	114,000
Other inedible	778,011	880, 154	810,549	765,800

* Source: U. S. Dept. of Commerce. † Estimated.

sumption of frozen desserts. Similar to ice cream, these products substitute vegetable and animal fats for butterfat. In 1953, over 20 million gallons was produced. While this looks insignificant when placed beside the tremendous amount of ice cream produced annually, remember margarine.

▶ Production to Drop—The large carry-over of edible fats and oils, gives promise of a record supply of food fats for the 1953-4 crop year. Actual production of lard and edible oils is expected to decline considerably from the 8.8 billion pounds of 1953.

The drop is expected to put the year's production below domestic and export requirements. Therefore, some decline in stocks is in

prospect.

► Indicators—The 1953 soybean crop was the smallest since 1949. The late-season drought is blamed. A record acreage was harvested, but yield was down 32 million bushels from 1952's 292-million, second-largest-on-record year.

Soybean prices were supported at 90 percent of parity. At year's-end, prices were considerably below 1952. This year, they are expected to rise above the support price of

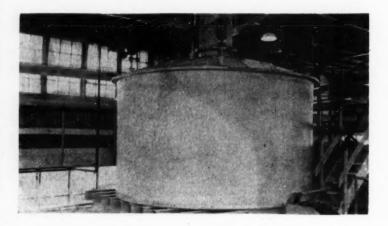
\$2.56 per bu.

With cottonseed the picture is a little different. Output for 1953 is expected to total about 3 percent over the previous year. Prices will be down from 1952's average of \$69.60 per ton, but should average above support.

Peanut production climbed some 40 million pounds to an estimated 1.4 billion. Prices have also risen slightly in '53 and are expected to average near support, 11.88c. per lb.

Output of greases and tallow—tied to the tail of the livestock industry—will probably remain at last year's record level of 2.55 billion pounds. Exports of these items are high, accounting for over a third of the total use. Prices are correspondingly low, probably the lowest of any fats in the world market.

This year will probably see a slight increase in exports as the search for markets is intensified. At the same time, forward-looking companies will be backing research as the best bet to obtain permanent and plentiful markets.



Plastics Sparked by Technology

Applications for plastic materials are being rapidly widened through new and improved formulations and fabricating techniques.

1953 saw an increase of 30 percent over 1952 in the production of synthetic resins, according to the Society of the Plastics Industry. The new all-time high approximates 3 billion pounds.

For this year, a 5 percent increase in production is forecast. The early months are expected to see a continuation of the mild decrease which developed during November and December 1953. This is not expected to extend past the half-year mark.

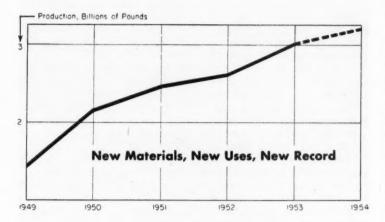
Gains will be due in a large measure to a number of note-worthy technical developments which emerged this past year. Among these are new plastic foams (epoxy, phenolic, vinyl, polyester and isocyanate) now all set for commercial testing. They offer good prospects for heat-resistant, insulating and bonding spacers between high-tensile strength skins to give strong, lightweight structures. Many applications for polystyrene and cellular cellulose acetate foams are already well known.

➤ Towards Better Heat Resistance— Progress has also been made in the struggle to improve heat resistance -through improved plastics per se and through new useful forms of existing heat-resistant types.

Along this line, Du Pont recently announced improved sintering methods and an improved grooved-roll calender for Teflon. Although only for ram extrusion and the heavy coating of wire, these improvements show promise of adaptation to the production of many other shapes which hitherto have been somewhat difficult to form. Bakelite is bringing in a polymer plant for chlorotrifluoroethylene which will add to the supply of that material now being produced by M. W. Kellogg.

Other fluorocarbon developments are bound to spring from government-sponsored research on improved heat-resistant plastics and synthetic rubbers. Organic substances and anhydrous hydrofluoric acid are the focal points for this research. (Minnesota Mining & Manufacturing Co. is producing fluorochemicals from these base materials by an electromechanical process.)

General Electric has recently announced a new silicone rubber hav-



ing an improved tear strength of 200 psi. and an improved tensile strength approaching 1,000 psi. Recent research shows that still further heat resistance may be expected from silicone resins when benzene rings and silicon appear in the chain without oxygen.

Too, transparent polyethyl acrylate rubbers cross-linked with special heat-resistant materials are reportedly quite satisfactory at 350 deg. F. and will stand limited exposures at 425 deg. F.

Temperature resistance of the polyesters is being improved by special monomers such as triallyl cyanurate.

Progress in Reinforced Plastics—Although reinforced polyesters (which represent the great majority of reinforced plastics) accounted for only 1 percent of the total resins produced in 1953, their rate of growth has been tremendous: 331-40 percent per year to an output of 26 million pounds in 1953.

Besides polyesters—phenolics, melamines, silicones, epoxys, alkyds, cellulosics and vinyls are reinforced. Fibrous glass is the main reinforcement for polyesters. With all these resins, other reinforcements are used in some degree. These include cotton, rayon, nylon, paper and the new synthetic fibers. (Tank shown on p. 202 is made of reinforced polyester.)

Among the chemical industry applications which sold in increasing volume during 1953 are tanks, tote boxes, trays, buckets and other containers. Chemical tanks and

trucks are being produced on a pilot basis.

Other major applications that made progress during 1953 are corrugated translucent reinforced plastics for glazing and structural use, flat sheets for printed electrical circuits, boats, highway signs, automobile bodies, refrigerator applications, bath tubs.

During 1954 the following developments in reinforced plastics may be expected:

- New resins which will maintain their mechanical strength under continuous exposure to certain heated liquids should further open up the tank and transportation field.
- Both at chemical engineering and mechanical engineering levels, research in pipe should produce important results.
- New reinforcements, chiefly synthetic fibers, may provide specialized materials for applications not now practical.
- Research accomplished in the sports car field is due to the translated into trucks, farm equipment, and probably station wagon components.
- Standardization in all the abovementioned fields under the sponsorship of the reinforced plastics division of the Society of the Plastics Industry is expected to provide sound engineering design data which will increase the acceptance of those materials.
- Considerable increase in the use of reinforced plastics for metal tooling is a certainty.

- Since it has been found that adequate capital and both mechanical and chemical engineering direction are needed for any company to make a success in this field, "bigger money" is being interested and reinforced plastic plants by the end of 1954 will be vastly different from the garage and basement operations of the 40's.
- ► More Rigid Vinyls on Way— Vinyl chloride produced in 1953 was 360-million pounds as compared with 340 million pounds for 1952. This in spite of the fact that film and sheeting consumed less than in former years. Production of vinyl resin molding materials was increased about 20 percent.

Rigid vinyls are expected to come into high volume in the near future. There is a tendency toward polymers or copolymers which will extrude or press easily, which can be readily welded, and which have improved toughness over the standard high molecular weight polyvinvl chlorides. Toughness is accomplished by admixture with synthetic rubbers as well as copolymerization. Rigid vinvls with greatly improved impact strength (around 10-15 ft.-lb. per in.) will presently be available from all major producers.

There is an emphasis on vinyl pastes. Practically all suppliers now have paste resins of the stir-in type which can be easily incorporated in plasticizer and which fuse on momentary exposure to high temperatures (160-170 deg. C.) to tough, rubbery coating for cloth, paper, metal or for unsupported structures.

Heavily-filled compounds which use so much filler that the rigidity is retained, in spite of small amounts of plasticizer, are finding application in large pipe fittings and in asbestos-filled flooring.

Increase in consumption of canned beer and the appearance of canned soft drinks has resulted in greater demand for vinyl lacquers for coating the inside of these cans.

1953 was a banner year for the sale of phonograph records, many of which are made of compounds based on vinyl resins.

Flooring industry during 1953 approximately doubled its use of vinyl resins (from 12 million pounds in 1952 to 25 million in

Production and sales of vinyl film and sheeting fell off during 1953. Some of the trouble results from misuse of vinyl film and sheeting and poorly fabricated parts made of these materials. To combat this trouble, the industry has adopted quality standards with the cooperation of the Department of Commerce.

Polyvinyl acetate sales during 1953 were about 40 million pounds, exclusive of that used for the chloride copolymer—which is expected to grow rapidly as a material for latex paint.

▶ Improved Phenolic Blends—Phenolic molding powder sales jumped about 49 percent in 1953 over 1952, due largely to increased use of large molded pieces, such as TV cabinets and drawers for furniture. 1953 figure: 310 million pounds approx. Laminating resin sales were higher (69 to 77 million pounds) due to an increase in the production of decorative laminates. Twenty-five million pounds were sold in 1953 as a binder for mineral wool used in thermal insulation.

A rubber-phenolic laminating resin is now available which permits the manufacture of shaped electrical components without post-forming techniques. Glass - phenolic molding compounds are reported to develop 10-15 ft.-lb. per in. of notch. Phenolic resin use in foundry casting continues to grow (1953 about twice 1952).

Last year saw beginning of production and marketing of phenolic resin for microscopic bubbles, making it possible for oil industry to reduce by 85 percent the evaporation loss from oil storage tanks.

Research on relationships between molecular structure and properties of phenolic polymers (1952 Hyatt Award—Dr. Howard L. Bender) uncovered a compound that has an extremely rapid cross-linking rate. This has resulted in commercial production of phenolic molding materials combining fast cure rate with hot rigidity. A phenolic type heat-resistant low-pressure laminating resin for use with glass fiber reinforcement, and a high-impact phenolic molding compound containing l-in. long glass fiber rovings

as the reinforcing filler were announced.

► Toward High-Impact Styrenes—Sales of styrene resin molding powders were up about 43 percent in 1953 over 1952, to nearly 300 million pounds. More high styrene polymers are available, and innumerable variants on the general theme of admixing these with small amounts of rubber to control all degree of toughness are here.

Over half of all polystyrene sold is expected to be of the high-impact type in the near future. Some of the newer applications using the toughness and dimensional stability of the newer materials: lawnmower wheels, machine guards, refrigerator parts. These materials continue to take over jobs formerly performed by metals. Their adaptability to shaping by a variety of methods is an important factor in this trend.

During 1953, the "do-it-yourself" trend accounted for a greatlyincreased demand for wall tile made of polystyrene.

There has been a tremendous increase in the use of styrene-buta-diene latex in rubber-base water-paints. In 1953, it is estimated that these paints accounted for 12 or 15 percent of all surface coatings produced in the U. S.

Polyethylene: Fastest Growing—Polyethylene is the fastest-growing plastic of all time. Capacity increased from 10 or 11 million pounds a month to 16 or 17 million pounds late in the year, will be increased by 8 or 9 million more in 1954. Four more companies, in addition to the two now in production, are expected to be actively marketing by the end of 1955.

Of 135 million pounds produced in 1953, about 40 million pounds were for film and nearly the same amount for electrical purposes.

Polyethylene is becoming available in smoother, more readilyworkable formulations.

Exposure of polyethylene to radiation in an atomic pile in England produced cross-linking and consequent change to properties characteristic of a thermosetting material. General Electric cathode-ray irradiated polyethylene is reported to have form-stability to 200 deg. C., and tensile strength of 100-200 psi. at 125 deg. C.

▶ Pipe, Film Lead Cellulosics—Winning back several markets in the process, sales of cellulosic resin molding materials were upped 41 percent during 1953.

Use of cellulose acetate butyrate pipe for gas, oil, and water lines continues to expand, based on satisfactory performance since 1945 and on economies in installation cost compared with copper and steel pipe.

Cellulose acetate increase was sparked by demand for thin film. Both cellulosic materials are on

Both cellulosic materials are on the way to producing clear sheet for volume use in vacuum molding.

▶ Tougher Acrylics—Methacrylates are now appearing in slightly cross-linked forms for less crazing and more toughness. Multi-axial hot stretching of polymethyl methacrylate 100-150 percent converts the amorphous brittle cast-plastic into an oriented tough laminar material which is craze and shatter-resistant. Fabricators have developed methods of using this characteristic of hot stretched acrylic plastic in aircraft canopies.

Acrylic base is now being offered for water-base paints. Together with alkyds, acrylics are beginning to supplement well established styrene-butadiene coatings.

Automotive industry continues to absorb more molded acrylics for medallions and light lenses each year. Same idea is developing for use on refrigerators and other appliance handles. Signs continue to use more cast sheet than any other civilian application. Extruded sheet has not yet come into big volume production.

Melamines, Epoxys Advance—While melamine resins have achieved new importance in wet strength paper and textile treatment, their gains have been spearheaded by tableware. There is a trend toward low-pressure molding compounds with consequent major saving in investment.

Now expanding quite far beyond their original uses as adhesives and protective coatings, the epoxies have shown excellent progress in glass laminates along with regular polyesters. They are of considerable value in the preparation of lightweight, strong and heat-resistant foams.



Photo courtesy of Standard Oil (N. J.

Drugs Have an Urge to Merge

Ethical and proprietary manufacturers break down their barriers as chemical companies come a wooing. Research fights for its budget. Synergism makes two greater than two.

At the annual meeting of the AIChE this winter, a chemical engineer working for E. R. Squibb & Sons walked over to a stranger from the Mathieson Chemical Co. and shook his hand.

"Hello, fellow worker. I thought I'd introduce myself since we're both working for the same company now."

And as 1953 drew to a close the same scene had been enacted by engineers from Merck & Co. with people from Sharpe & Dohme. In November, American Cyanamid Co. acquired the antibiotic division of Heyden. This included its plant at Princeton, N. J., all patent rights and processes relating to the manufacture of Heyden's line of antibiotics.

► Why Merge?—There's nothing new about mergers. But as Knox Ide told the American Pharmaceutical Manufacturers, "The use of this well-known method of business expansion is relatively new to the pharmaceutical industry and needs some explanation."

For one thing the line of demarcation between ethical (sells only to physicians) and proprietary (sells directly to consumers) drug houses was further obscured in 1953. Some companies boldly offered fine pharmaceutical preparations both to the medical profession and to the consumer.

Total U. S. drug sales in 1953 (at the manufacturers' level) were almost \$1.5 billion. Of this, about 35 percent was sold over-the-counter directly to the buyer.

The basic cause of both the Merck-Sharpe & Dohme and the Mathieson-Squibb mergers was that the best interests of the chemical manufacturer would be served by entering the packaged, trade-marked pharmaceutical field.

► Mergers to Continue — Some of the chemical companies have a great deal to offer the pharmaceutical manufacturers financially. It is certainly more than a rumor that other leading chemical companies will be looking for qualified pharmaceutical companions in 1954. They'll be eyeing the predicted U. S. sales volume of almost \$1.7 billion as well as an increasing foreign market.

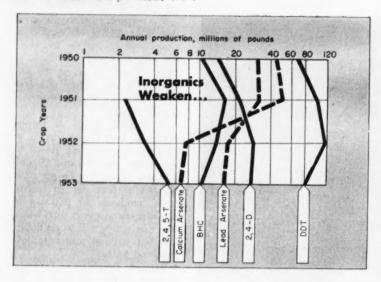
With funds frozen in foreign countries, drug makers started to plan for manufacturing abroad to supply the export demand (Squibb in Latin America). To get some use out of these foreign credits, some companies are planning to purchase research away from home. You may not be able to get dollars out; but you can mail notebooks back and forth.

▶ Research Recession — Domestic research is the backbone of the pharmaceutical industry. Again in 1953 research budgets soared. Management was getting a growth of about \$3.50 in sales volume for each research dollar. But these were excess profit dollars. In 1954 excess profits become just plain profits. Research will have to fight for its usual share. Stockholders will want higher dividends.

Also contributing to the pressure on the research department will be the decrease in profit percentage of sales volume. Prices of the wonder drugs have been dropping wonderfully. Penicillin was hard to find in 1944 at \$400 per million units. Today the same dose is only 10 cents. There'll be emphasis on quick-return applied research, less on basic studies.

▶ Cures to Come—In the year past, laboratories were putting drugs together to get combined effects. They found that combinations of antibiotics may be more powerful than the sum of the component parts. Each enhances the other. A combination of streptomycin, bacitracin and polymixin is claimed to be effective in killing or inhibiting 23 recognized types of bacteria found in skin wounds—thanks to the synergistic effect.

Polio vaccine will undergo a large-scale test this spring. Cancer might yield on the leukemia front to 6-mercaptopurine. Multiple-sclerosis is a 1954 target. And even epilepsy may be removed from the column marked "no known cure for."



Chemical Pesticides Go Forward

Demand for herbicides was strong in 1953, but insecticides lagged. The future looks bright for synthetic organics. They are revolutionizing farming methods.

The chemical pesticide industry, growing by leaps and bounds since 1946, continued making progress in 1953. But most people in the industry will remember 1953 as a year of intensive competition and readjustment. This, in spite of production, which—while not up to the record year of 1951—was at a respectable level.

Synthetic organics continued to lead the way. Between 80 and 90 percent of the 1953 business was built around new synthetic chemicals, not a pound of which was available in 1945.

▶ Demand Off—For the first half of 1953, demand for insecticides was definitely off and production was cut back. This was due to low insect infestation and drought conditions. Demand increased greatly during the second half of the year.

Any analysis of this has to be closely tied in with the cotton crop situation. Cotton requires the greatest tonnage of insecticides. From 65 to 85 percent of the production of calcium arsenate and benzene hexachloride is consumed

in the cotton crop. From 80 to 95 percent of Heptachlor and Toxaphene insecticides is used on cotton. An estimated 20 to 30 percent of DDT production goes to cotton.

During the first half of '53, the build-up of boll weevils was slight. Consequently the demand for insecticides fell off. In the early fall, a heavy infestation of cotton pests sprang up in the Delta area of the South. Insecticides moved in good quantities and inventories were greatly reduced by the end of 1953.

An outbreak of army worms, late in the year, in the grain crops of the Midwest also moved sizable amounts of insecticides of all types.

Herbicides Hold—One bright spot of the 1953 season was the continuing strong demand for herbicides. Weed killers like 2,4-D and 2,4,5-T (which make up 80 percent of all organic herbicides sold) found a ready market.

The slow demand for insecticides during the first half of 1953, coupled with expanded productive capacity, weakened the price structure for all pesticides. Prices dropped sharply. In January of '53 the average price of nine major chemical pesticides stood at 80 percent of 1948 prices. At the close of 1953, the average price of these same chemicals was 56 percent of 1948 prices. This price cutting reduced profits. But the situation has stabilized itself recently.

► In 1954—The industry started 1954 with a healthier outlook:

 Inventories were down at the end of 1953. With any reasonable demand, fuller use of plant capacity can be expected.

• The herbicides 2,4-D and 2,4,5-T should be in strong demand in 1954, and beyond. The farmers are going for these weed killers—actually efficient labor savers. Also, the demand for herbicides is not as dependent on weather or pest conditions as insecticides. The potential market for herbicides is very bright. Approximately 10 percent of our cropland was chemically treated in 1953 to kill weeds.

Look for some newcomers in this field. Du Pont's CMU* is one of the most promising herbicides to come along since 2,4,5-T. Another one is Dow's Dolapon (2,2' dichlor-propionic acid).

• There will be increasing talk about and use of fertilizer-pesticide mixtures in 1954. To farmers, this mixture makes sense. He can fertilize and dust in one operation.

Systemic insecticides should increase in use. Right now what seems to be holding back such agents as Pittsburgh Agricultural Chemical's Systox is the question of whether it's safe to use on crops.

Over the long haul, pesticides must take a prominent place among the growth chemicals. The market will keep on growing as long as the industry can provide effective materials at low cost.

Here is a detailed run-down of what happened in 1953 and what's expected in 1954—for some of the important pesticides:

1. DDT. This insecticide widely used on many crops and livestock, was produced to the tune of 79.9 million pounds in the 1953 crop year. About 54 million pounds was consumed domestically and the rest exported. This is down from the 115 million pounds turned out in

^{• 3 (}p-chlorophenyl) -1,1-dimethylurea.

the '52 crop year. It's estimated by the USDA, that between 65 and 85 million pounds will be required in the 1954 season.

2. BHC. Unrefined benzene hexachloride is used chiefly for boll weevil control, while the pure gamma isomer—such as Lindane—is used in increasing amounts for fly and mosquito control. Estimated production for 1953 is 10.2 million pounds (based on 100 percent gamma isomer). Consumption stood at 7 million pounds. About 16 million pounds was produced in 1952. It's estimated that between 7 and 11 million pounds will be needed in 1954.

3. Parathion. Widely used as a miticide, about 6 million pounds of this organic phosphorus compound was produced in 1953-almost all of it used. In 1954-a need for 3 to 4 million pounds.

4. Lead Arsenate. Some 17-million pounds were produced in 1953—a big drop from the 30 million of 1950. The difference has been taken up by the synthetic organics. Some 16 to 30 million pounds is the estimated requirement in 1954.

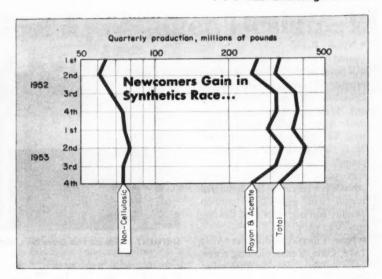
5. Calcium Arsenate. Also continued the downward trend of inorganics. In the '53 sesason 8 million pounds were produced. In 1951 it was 49 million!

6. Sulfur. Organics are rapidly replacing sulfur for pest control. About 300 million pounds was used in 1953. In 1950, 538 million pounds. Requirements in 1954 are about the same as in 1953.

7. 2,4-D. This selective weed killer-effective against broad-leafed plants-was in good demand in 1953. Some 27.3 million pounds was made-more than 6 million over the 1951 production. In 1954, USDA estimates the requirement at 26 million pounds.

8. 2,4,5-T. A weed killer—death to brush and woody plants. It was produced to the tune of 5.3 million pounds. This is more than 2 million above the 1952 production. In 1954—requirements are between 4 and 5 million pounds.

9. CIPC. A grass killer having a steadily rising demand. Just coming into its own, some four manufacturers turned out 500,000 pounds in 1953. Between 1 and 1 million will be needed in 1954.



Fibers Withstand Buffeting

Their output increases even though market dips. Nylon expansion continues unabated. Acrylics meet challenge from wool as prices are pared, dyeing processes improved.

Despite a depressed market, total U. S. synthetic fiber production climbed toward 1.5 billion pounds in 1953, a 6 percent gain over 1952. Non-cellulosics topped 300 million pounds, up 15 percent, while rayon and acetate exceeded 1.18 billion, an increase of almost 4 percent over 1952.

Current capacity for all manmade fibers, about 2.07 billion pounds per year, will be lifted 12 percent to 2,325,000,000 lb. by October 1955. Producers of noncellulosics will push through a 43 percent increase in the next two years, raising capacity from 428 million to 612 million pounds. By next July, they will reach 510 million.

Rayon capacity, currently 1,084,-000,000 lb., will reach 1,155,000,-000 lb. when expansion is completed next July. Acetate capacity will remain unchanged at 558 million pounds.

▶ Breakdown—By the end of 1954 non-cellulosic output may exceed 500 million pounds. This would break down into 300 million of nylon, 90 million of acrylics, 35 million of Dacron polyester, 35 million of saran, 20 million of protein fibers, 30 million of glass fibers, plus 1 or 2 million of polyethylene fiber and perhaps 3 or 4 million pounds of other synthetics.

▶ Acrylic Fracas—Competing with wool at \$1.73 a lb., makers of acrylics have also been plagued by snags in dyeing and finishing. No sooner did Du Pont bob 10 c. a lb. off its Orlon price than Chemstrand cut Acrilan to \$1.40 per lb. Acrylic producers claim they are overcoming difficulties in dyeing and mill processing.

Chemstrand's new acrylic plant, rated at 30 million pounds per year, produced only a trickle last year, should do better this year. Present capacity to produce Orlon, Acrilan and dynel exceeds 75 million pounds, glutting the current market. Carbide's plant at Spray, N. C., will add 30 million pounds, and American Cyanamid's X-51 is another contender.

In 1953 Du Pont started producing its Dacron polyester fiber in a new \$40 million plant at Kinston,

S. C. Its annual capacity: 35 million pounds.

Nylon Boom—Nylon is a big ground-gainer, and new producers will boost output. Chemstrand will produce 50 million pounds yearly at Pensacola, Fla., and Allied will turn out 20 million pounds of nylon 6, made from caprolactam, at Hopewell, Va. American Enka at Enka, N. C., will make about 2.5 million pounds, may also build a \$35 million plant to make 20 million pounds per year of nylon. Industrial Rayon will produce 6 million pounds annually in a new Covington, Va., plant.

New Fibers—Goodrich at Avon Lake, Ohio, is pilot-planting a new polyvinylidene cyanide fiber called Zetek. Du Pont's new Orlon 42 is a better dyeing acrylic staple. Celanese, Industrial Rayon and Tennessee Eastman are all at work on acrylics. American Enka and Industrial Rayon are producing higher-tenacity rayon tire yarns.

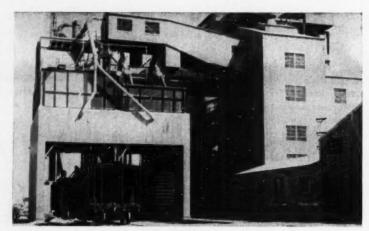
In addition to Du Pont, three other producers plan to turn out caprolactam-type nylon staple. Type 6,000 Dacron polyester staple doesn't pill in spun-yarn fabrics. In protein fibers, Vicara with a better crimp is offered, as is bleached Vicara. Du Pont is experimenting with tetrafluoroethylene polymer as a fiber.

► Improved Processes — Pressurized dyeing at 15-25 psi., use of the cuprous ion technique, new dyes such as the Genacrils, and new polymers have all helped to lick the dyeing problem.

Acrilan is now easier to dye, and can be union-dyed in wool blends. Spun-dyed dynel is offered in eight colors. Celanese has achieved union-dyeing of acetate and Dacron or acetate and wool blends. American Enka and Courtalds are producing spun-dyed rayon.

More emphasis is put on blending. Princeton researchers have experimented with the spinning of a blend of cellulose acetate and acrylonitrile from a common solvent.

Cyanoethylation of cotton produces stronger yarn that resists rot and withstands heat. Chemical treatment of such modified cotton, by aminization, for example, can create startling new products.



SHIPMENT of soda ash from Green River, Wyo., started last year and now . . .

Soda Ash Is Ready

With modernized equipment and with a new source of supply, soda ash can meet all challenges of '54.

Soda ash in 1953 made the news in several ways.

► Wyoming—By far the most significant event took place in Green River. There Westvaco has finally reached capacity operation and is producing at the rate of some 820 tons per day (see p. 342).

b Louisiana and New York—Solvay has completed its two-year rebuilding program at Baton Rouge which ups capacity by one-third. At Syracuse, the modernization program, in effect, replaces older equipment with a practically new plant having perhaps 10 percent more capacity than the old unit.

► Virginia—At Saltville, Mathieson has completed a 50,000-ton-peryear plant to turn out a coarse light ash to be used for commercial production of glass. This development, if it is successful, could save the glass industry several million dollars by licking some materials handling and furnace life problems.

Other companies are also trying to alter light ash to suit glass requirements. So far, reported results are inconclusive.

► The Consumption Pattern — Chemical Engineering's traditional breakdown of uses shows the expected rise for all categories with one exception—soap (see p. 200). This drop of 15,000 tons is more than offset by the gain in ash used for phosphate production.

An innovation on these pages this year is an attempt to analyze the tonnage of soda ash used to manufacture other chemicals. As expected, phosphates take the biggest bite.

Where Our Soda Ash Goes

(Thousands of Tons)	1952	1953
Glass	1.410	1,590
Caustic & bicarbonate	766	790
Non-ferrous metals	320	430
Pulp & paper	305	330
Soap	115	101
Cleansers*	135	160
Other chemicals	1.180	1,350
Water softeners	95	120
Textiles	39	40
Exports	106	160
Petroleum refining	31	22
Miscellaneous	262	226
Total	4.764	5.330

Chemical Engineering estimates.

Based on 100% NasCOs. *Includes modified sodas.

How Other Chemicals Consume Ash

(Thousands of Tons)	1952	1953
Calcium carbonate	180	190
Sodium chromates	90	110
Sodium hydrosulfite	12	13
Sodium Nitrate	160	170
Sodium phosphate, tripoly	280	350
Dibasic	60	70
Tetra	55	65
Other*	32	34
Sodium silicate	210	230
Sodium sulfite	40	45
Sodium thiosulfate	14	15
Unaccounted-for	47	58
Total	1 180	1 250

*Tribasic sodium phosphate consumes approximately 47%; monobasic, 27%; meta, 9%; acid pyro 17%.

Shortcut to Heat Exchanger Design-VI

You can cut in half the time for designing heat exchangers by the conventional methods. Here's how for condensation of vapors from mixtures of vapor and non-condensable gases.

C. H. GILMOUR

Condensation or partial condensation of vapors from a mixture of vapor and noncondensable gases is a problem common to the chemical and petroleum industries. Although methods for the design of apparatus to effect this kind of heat transfer are found in the various heat transmission textbooks, the reader is apprised of the fact that the design methods are tedious. He is also told that a substantial fouling factor should be used to take care of the uncertainties of the condensation and cooling processes. Finally, it is indicated that it is necessary to pick a heat exchanger and see if it will perform the required duty rather than to calculate the number, diameter, and length of tubes required to meet the performance requirements.

Most of the proposed methods for the design of the subject type of heat exchanger are similar to the method proposed by Colburn and Hougen (Ind. Eng. Chem. 26, p. 1178, 1934). This method combines heat transfer and diffusion and is undeniably a satisfactory method for design. However, when a designer is confronted with the problem of designing several of this type of heat exchanger and the process fluids contain perhaps a halfdozen condensable vapors, in addition to three or four noncondensable gases making it difficult to estimate a net diffusivity, he desires a shorter method for solving these problems. The method presented herewith therefore denies neither the existence nor the efficacy of the methods appearing in the heat transfer literature. method, however, has been used with more than a fair degree of success for some fifteen years and it fits into the general scheme of the shortcut methods for heat exchanger design.

C. H. GILMOUR is staff engineer with Carbide and Carbon Chemicals Co., at S. Charleston, W. Va.

Mechanism of condensation and cooling of gas-vapor mixtures in accordance with this shortcut method may be briefly described as follows:

Sensible heat necessary to cool the gas throughout the entire temperature range, plus the sensible heat to cool the vapor which is condensed through part of the temperature range, is assumed to flow through a gas film. The sensible heat described above, plus the latent heat, plus the sensible heat for liquid cooling is assumed to pass through the condensate film, the tube wall, the scale, and the cooling fluid film.

These two processes, namely, gas cooling and condensation, take place simultaneously on the same area. Therefore, of the total available temperature difference, part is used across the gas film and the remainder across all the other films in series.

Temperature difference required to cool the gas is equal to the gas heat load divided by the product of the gas film coefficient and the total area. Temperature difference required to remove the heat through the other films is obtained by dividing the total heat load by the product of the over-all coefficient (of the condensate, wall, scale, and cooling medium films) and the total area.

The sum of these two temperature differences must equal the over-all mean temperature difference available in accordance with the design problem. The outlet temperature of the cooling medium must be below the dew point of the mixture being cooled for this method to apply.

The above process may be illustrated by the following equations:

$$\frac{q_{\theta}}{h_{\theta}A} = \Delta T_{\theta} \qquad (A)$$

$$\frac{q_T}{UA} = \Delta T_T \qquad (B)$$

$$\Delta T_{\theta} + \Delta T_{T} = \Delta T_{M} \tag{C}$$

$$\frac{q_a}{h_a \Delta T_M} + \frac{q_T}{U \Delta T_M} = A \quad (D)$$

In these equations q represents the heat load in Btu./hr., the subscript g

About "Shortcuts to Heat Exchanger Design"

Note—The first article in this series (Oct. 1952, p. 144) developed a basic method for the design of heat exchanges. Use of the method for conditions of no phase change, forced convection, turbulent flow, and cross flow in shell was described.

Article II in March 1953 issue (p. 226) described the use of the basic method for conditions of no phase change, forced convection, turbulent flow, and parallel flow in shell.

Article III in April 1953 issue dealt with heaters and condensers in which the condensing vapors contain no more than a small amount of superheat or non-condensible vapor.

Article IV in the October issue dealt with condensers and subcoolers in which the condensate consists of miscible fluids, and Article V in the February issue with condensers and subcoolers in which the condensate consists of immiscible liquids. Article VII will deal with the change in phase known as boiling or evaporation.

It will be necessary to refer to the first article for certain alignment charts, nomenclature, as well as development of the basic method. When you do, please note that W. was omitted under work factors for pressure drop in Eq. VII. In this same equation the exponent on the term P is a 3.—Editor.

refers to the gas and vapor sensible heat and the subscript T refers to the total heat load. Area required for the simultaneous heat transfer processes is shown in Eq. (D) which is of course obtained from Eqs. (A), (B), and (C). Heat transfer coefficient for the gas film varies throughout the length of the exchanger because of the variation in weight rate of flow due to condensation of part of the fluid. Overall coefficient, designated by U in Eq. (D), also varies due to the variation in condensate rate. Finally the mean temperature difference varies throughout the length of the heat exchanger.

It becomes necessary to make certain simplifying assumptions at this point to consummate the method of design. It is assumed that the vaporgas mixture entering the condenser cools in the gas phase to a fictitious mean temperature obtained from a plot of temperature versus percent total heat load. It is further assumed that condensation takes place at this temperature, and that the uncondensed portion of the mixture is cooled in the gas phase between the fictitious mean temperature and the outlet or low temperature, and that the condensate is cooled in the liquid phase throughout the same temperature range.

Temperature of the cooling medium will plot as a straight line on the temperature versus percent total heat load chart. By subtracting the cooling fluid temperature from the vapor temperature an instantaneous value of temperature difference may be obtained and plotted on the same chart. If the temperature difference line is straight, then the log mean temperature difference of the inlet and outlet temperature differences is the proper value to use.

If, however, the temperature difference line is a curve, it is necessary to average the temperature difference by some means. An integrated mean average is not necessarily the proper mean temperature difference to use. The following method is suggested. Draw a straight line between the temperature differences at 0 percent and 100 percent heat load. Plot the excess ΔT (between straight line and the curve) versus percent total heat load and find integrated mean excess by use of planimeter, counting squares, Simpson's rule or other means. Add this mean excess ΔT to the log mean ΔT .

Development of Design Equations

Wg cg $(^{\dagger}_{H} - ^{\dagger}_{M})$ = Gas cooling (precondensing zone)	(VI-I)
$W_{v_i} c_{v_i} (t_H - t_M) = Vapor cooling (precondensing zone)$	(VI-2)
Wc \(\lambda\) = Condensing	(VI-3)
Wg cg $(t_M - t_L)$ = Gas cooling (post condensing zone)	(VI-4)
$W_{V_0} c_{V_0} (f_M - f_L) = Vapor cooling (post condensing zone)$	(VI-5)
W _C C _L (t _M -t _L) = Condensate cooling	(VI-6)
Wo C_C $H^{-1}L$) = Total heat load = Sum of equations VI-1 through VI-6	(VI-7)
Wg + Wv _j = W _j = Total gas + vapor entering	(VI-8)
$W_g + W_{v_0} = W_{h}$ = Total gas + vapor leaving	(VI-9)
$W_i (c_{ave})_i (t_H - t_M) = h_i \wedge \Delta T_i$	(VI-IO)
$W_{N}\left(c_{OVe}\right)_{N}\left(t_{M-}t_{L}\right) = h_{N} A \Delta T_{N}$	(VI-II)
$W_0 c_0 (t_H - T_L) = h_C A \Delta T_C$	(VI-12)
W_0 c_0 $(T_H - T_L) = h_0$ A ΔT_0	(VI-13)
Wo co (TH-TL) = hw A ATw	(VI-14)
$v_0 c_0 (T_H - T_L) = h_S A \Delta T_S$	(VI-15)
$h_{j} = \frac{16.6 (c_{QV})_{j}}{d_{j}^{0.2}} \begin{bmatrix} w_{j} & 144 \\ 3600 & 0.786 & d_{j}^{2} \end{bmatrix}^{0.8} \frac{d_{j}}{d_{0}}$	(VI-16)
$h_{\rm n} = \frac{16.6 \left(c_{\rm QV}\right)_{\rm N}}{d_{\rm j}^{0.2}} \left[\frac{w_{\rm N}}{3600 \cdot {\rm n} \cdot 0.786 \cdot d_{\rm j}^{2}}\right]^{0.8} \cdot \frac{d_{\rm j}}{d_{\rm o}}$	(VI-17)
$h_c = 0.925 \text{ k} \left(\frac{g p^2}{\mu \Gamma}\right)^{1/3} \times \frac{d_1}{do}$	(VI-I8)
$h_0 = \frac{0.33 \times 0.6 \times c_0}{\left(\frac{c_0 \ \mu_0}{k_0}\right)^{2/3}} \times \mu_0^{0.4} \times \left(\frac{12}{d_0}\right)^{0.4} \times (G_e)^{0.6}$	(VI-19)
$h_W = \frac{k_W \times 12}{d_0 - d_1/2} = \frac{24 k_W}{d_0 - d_1}$	(VI-20)
ΔT_{1} + ΔT_{N} + ΔT_{C} - ΔT_{O} + ΔT_{w} + ΔT_{S} = ΔT_{M}	(VI -,21)

Calculation of mean vapor temperature and mean temperature difference is time consuming and would normally be done by the process engineer and not the heat exchanger rating engineer.

For rapidly estimating the size of the heat exchanger for this type of service, you could use a log mean temperature and a log mean temperature difference of the inlet and outlet conditions for the value of the fictitious temperature and the mean temperature difference, respectively. This would result in a safe design but not the most economical. DEVELOPMENT OF DESIGN EQUATIONS

For the same reasons given in Article IV, the vertical vapor-in-tube condenser is the only type of condenser given consideration for condensing gasvapor mixtures. The principle reason is that the covdensate is always colder than the vapor and therefore it is possible to cool the vapor and liquid very closely to the same temperature. If liquid cooling does not keep pace with gas cooling, it is possible to have revaporization which necessitates recondensation, and thus requires more surface area.

	umerico Factors	ıl	Physical Prope Factors	rty	Work Factors		Mechanical Design Factor	°s
$\frac{\Delta T_1}{\Delta T_M} =$	2.48	x	1	×	$w_l^{0.2}(t_H-t_M)/\Delta T_h$	×	d ₁ 0.8/n ^{0.2} L	. (VI-23) ¹
$\frac{\Delta T_{0}}{\Delta T_{M}} =$	2.48	×	1	x	$w_N^{~0.2}(t_M\!-\!t_L)/\Delta T_M^{}$		d ₁ 0.8/n ^{0.2} L	(VI-24) ²
$\frac{\Delta T_{C}}{\Delta T_{M}} =$	8.55	×	M1/3 z1/3	×	$w_c^{1/3} x \frac{w_o \left(T_{H^-} T_L\right)}{\Delta T_M}$	х	n4/3d ₁ 4/3L	(VI-25) ³
$\frac{\Delta T_{Q}}{\Delta T_{M}} =$	0.27	×	z ₀ 0.8/3 _{M0} 2/9 809	×	$\frac{W_0^{0.4}(T_H-T_L)}{\Delta T_M}$	×	p0.6	(VI-26)
$\frac{\Delta T_W}{\Delta T_M}$ =	159	×	Co/kw	×	$\frac{W_0 (T_H - T_L)}{\Delta T_M}$	×	n doL	(VI-27) ⁵
$\frac{\Delta T_8}{\Delta T_M} =$	3820	×	co/hs	×	$\frac{w_0\;(T_{\text{H}}\!-\!T_{\text{L}})}{\Delta T_{\text{M}}}$	ж	nd _o L	(VI-28)
ΔT_{M} +	$\frac{\Delta T_n}{\Delta T_M}$ +	ΔT _C	$+ \frac{\Delta T_0}{\Delta T_M} + \frac{\Delta T_W}{\Delta T_M}$	+ 1/2	$\frac{\sqrt{2}L^{N}}{2} = 1$			(VI-29)
ΔP ₁ =	0.7	x	z ₁ 0.2/s ₁	×	(W _i / _n) ^{1.8}	x	Lo/d1+25 (5.4 d1)3.8	(VI-30)
ΔP ₂ =	0.326	×	50	×	w _o ²	×	P3Do	(VI-3I)

FOOTNOTES

1. W, in this equation as written is in pounds per hour total fluid entering tube side. If alignment chart is used to obtain factor use thousands of pounds

tube side. If alignment chart is used to obtain factor use thousands of pounder hour.

2. W_s in this equation as written is in pounds per hour total fluid leaving tube side. (Inert gas plus uncondensed vapor). If alignment chart is used to obtain factor use thousands of pounds per hour.

3. W_s in this equation is thousands of pounds per hour condensed on the tube side and W_s is thousands of pounds of cooling fluid on the shell side. No alignment chart is used since the cube root of W_s is easily obtained by slide rule or tables. Physical properties are for the condensate.

4. The numerical factor in this equation is for the case in which the shell side cooling fluid is a liquid and the tube spacing is triangular. See computation sheet for numerical factor when shell side cooling fluid is a gas and when the tube spacing is on square centers. W_s in this equation as written is in pounds per hour of shell side cooling fluid. If alignment chart is used to obtain factor use thousands of pounds per hour, and note that N_{PT} is always equal to 1.

5. W_s in these equations is shell side cooling fluid rate in thousands of pounds per hour.

per hour.
6. W_{θ} in these equations is shell side cooling fluid rate in thousands of pounds 7. Wi in this equation is total fluid entering tube side in thousands of pounds

8. W_{\bullet} in this equation is shell side cooling fluid rate in thousands of pounds per hour.

In developing the equations for the various heat transfer factors further simplifying assumptions are made. Since the specific heats of the condensable vapors and those of the inert gases will usually differ from each other, we may write equations for the gas and vapor separately, such as shown in Eq. VI-1 and VI-2. The sum of these two equations is equivalent to the left-hand side of Eq. VI-10, in which an average specific heat is used. When the expression for gas film coefficient from Eq. VI-16 is inserted in Eq. VI-10, the specific heat cancels out. Same procedure is used for the

gas cooling in the postcondensing zone as indicated in Eqs. VI-4, VI-5, and VI-11.

Actually it would be proper to use an average weight rate of flow in these two zones but it is more convenient to use the inlet weight rate of flow in the precondensing zone and the outlet weight rate of flow in the postcondensing zone, the former being too high and the latter being too low. Since the length of these two zones is unknown but the total length of the zones is equal to the length of the condenser, the use of the latter in both equations partially counterbalances the fact that

average weight rates of flow are not

In Eqs. VI-12 through VI-15, the total heat load is equated to the heat transferred across each of the separate films. These equations are then solved for the temperature drop across each resistance and the sum of these temperature drops equals the mean temperature difference in accordance with Eq. VI-21.

Substitution of equations for film heat transfer coefficients, together with the Weber equation for thermal conductivity, and equations representing the physical characteristics of shell and tube heat exchangers produces the design Eq. VI-23 through VI-29. These equations, in addition to pressure drop Eqs. VI-30 and VI-31, may then be adapted to a computation sheet, such as shown in the example which follows. The similarity between this computation sheet and those appearing previously will be evident. Some of the alignment charts appearing in Articles I and III need to be used.

It will be noticed that no expression for the liquid cooling film coefficient has been used in the above development. This is neither an oversight nor a simplifying assumption because the liquid cooling takes place simultaneously with condensation through the condensate film across which there is a finite temperature difference. There is thus a distinction between the liquid cooling in this type of condenser-cooler and the type of condenser described in Article IV of this series in which the film is cooled in a different manner. As long as the sensible heat of liquid cooling is included in the total heat load liquid cooling will be properly taken care of.

APPLICATIONS

This method of design may be used for the design of condensers in which the vapor consists of a mixture of completely condensable vapors having a varying condensing temperature. In adapting the computation sheet to problems of this kind there would be gas cooling only in the precondensing zone, and therefore the column entitled, "Gas Cooling Postcondensing Zone" would not be used. An example of this type of problem is indicated by Example 13.3, p. 331, "Process Heat Transfer," Kern, McGraw-Hill Book

This method of heat exchanger de-

sign may also be applied to problems in which the vapor enters the condenser superheated provided the outlet cooling fluid is below the dew point of the incoming gas-vapor mixture.

EXAMPLE

To illustrate the use of this shortcut method for the design of gas-vapor condensers, Example 13.5, p. 346, "Process Heat Transfer," will be used. The problem may be stated as follows:

A mixture of 4,500 lb. per hr. of steam and 1,544 lb. per hr. of carbon dioxide is to be cooled from 267 to 120 deg. F. Cooling water enters at 80 and leaves at 115 deg. F. The operating pressure is 30 psig. and under these conditions approximately 4,475 lb. per hr. of steam condenses. The fouling factor to be used is 0.0055. Calculate the number of \$\frac{1}{2}\$ in O.D. by 16 BWG stainless steel tubes 12 ft. long required to perform this duty.

First step is to plot the vapor temperature versus percent of total heat load, which for this problem may be obtained from the heat balance at the bottom of p. 347 in Kern. The next step is to draw a straight line representing the cooling water temperature and then by subtracting the cooling water temperature from the vapor temperature, a curve representing the temperature difference may be obtained and plotted. Such a plot is shown in Fig. 1. The average vapor temperature (fictitious condensing temperature) may be found from an average of the temperatures for the various intervals. Thus for this case we have taken the following temperatures: 267, 266, 265, 263, 262, 259, 256, 249, 236, 211, 157, and 120. The total is 2,811, which divided by 12 gives a mean temperature of 234 deg. F. If a straight line is drawn between the temperature difference at 0 percent and 100 percent of total heat load the excess temperature difference at each 10 percent interval will be as follows:

Percent	Excess ΔT
0	0
10	15
20	26
30	40
40	52
50	66
60	75
70	80
80	80
90	61
100	0

If these values are plotted and aver-

aged the mean excess ΔT is 43 deg. which added to the log mean temperature difference of 84 deg. results in a mean temperature difference of 127 deg. The remaining manipulations on the computation sheet will be evident from similar computations made in previous articles. It will be noticed that 224 tubes would be required or a total of 528 sq. ft. No particular significance is to be attached to the fact that the area is about the same order of magnitude as that obtained in the book because one is a vertical vaporin-tube condenser and the other a horizontal vapor-in-shell condenser. Were it not for the stipulations of tube size

and length and rather high fouling factor in this problem, this duty could be accomplished by considerably less area.

It will be noticed from the computation sheet that the pressure drop is only 0.1 psi, where as the operating pressure is 30 psi., and so it would be possible to use smaller diameter and longer tubes and thus reduce the magnitude of the factors for gas cooling. In problems where the percent inert gas is higher than in this problem it will be apparent from the heat transfer factors that small tubes and long tubes will produce the most economical design for this type of service.

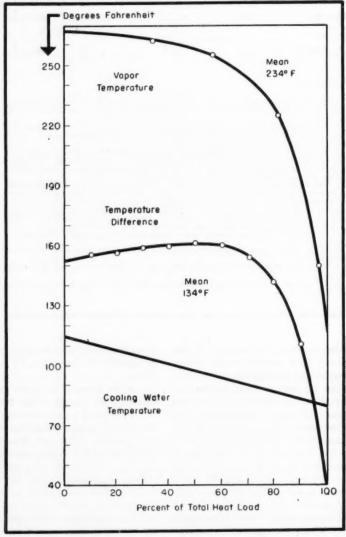
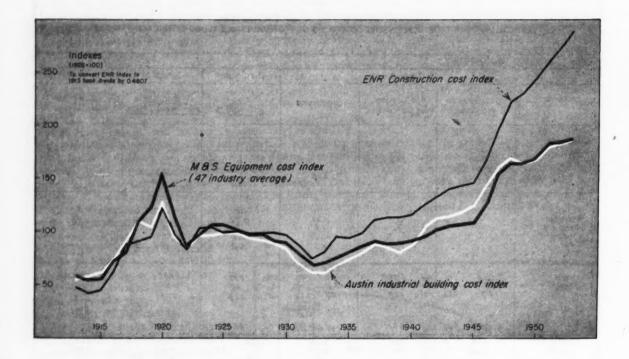


Fig. 1-Making this plot is part of example problem solution.

COMPUTATIONS FOR HEAT EXCHANGERS FOR VERTICAL VAPOR-IN-TUBE CONDENSERS CONTAINING NON- CONDENSABLE FLUIDS, CROSS FLOW IN SHELL

Fouling			
Scale Tar Polymer			
3820			
is 182			
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a 392			
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- a - 5q			
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1914"			



Equipment Costs Still Going Up

Tabulated below are the annual average indexes of comparative equipment cost for eight process industries and four related industries, prepared by the evaluation engineering firm of Marshall and Stevens, Incorporated of Illinois, Chicago 4. Extending from 1913 through 1953, the annual averages are supplemented by the quarterly figures on the individual charts at the right.

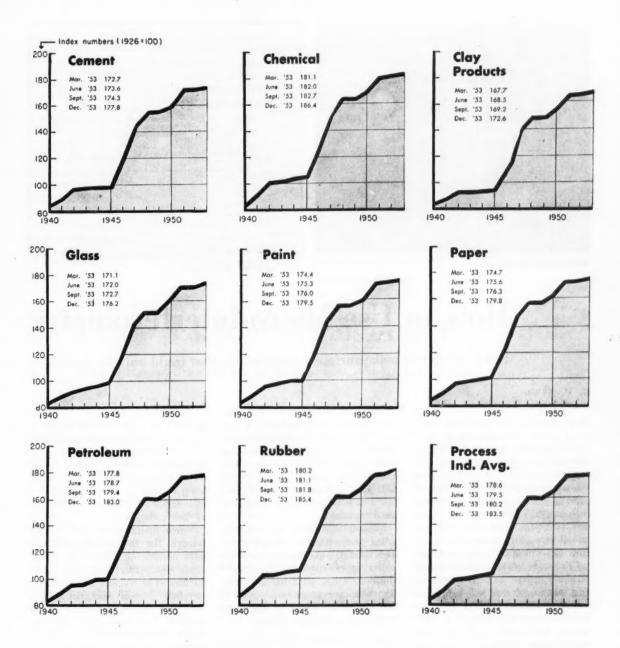
A tabulation in this form, giving quarterly data, appears each month on the Industry Trends page in our economics section, showing the latest revision for the quarter ending March, June, September or December.

This feature was introduced initially on pages 124-6 of our November 1947 issue, in an article by the late R. W. Stevens, partner of the firm, which described the basis for the 47 industry indexes regularly issued by the firm, and the method of weighting of the process industry average.

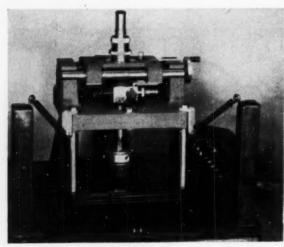
Charted above is the M & S 47-industry average plotted on the same grid with the Austin Co.'s index of industrial building costs, and the Engineering News-Record index of heavy construction costs.

All components of the M & S index held quite constant through 1953 until the last quarter.

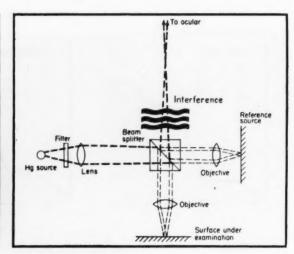
Marshall and Stevens Annu	al Inde	exes of	Comp	arative	Equip	ment C	osts, 1	913 to	1953	1926 :	= 100						
Industry	1913	1916	1918	1920	1922	1924	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Average of all.	57.9	62.8	109.7	153.3	85.5	105.3	100.0	96.0	96.5	91.9	87.0	76.9	66.1	69.4	74.6	78.0	81.6
Process Industries																	
Cement mfg	58.0	62.5	109.1	149.9	83.7	104.6	100.0	96.5	97.2	92.5	87.0	76.8	68.9	70.7	75.7	78.1	82.2
Chemical	59.0	63.0	111.9	150.5	82.5	105.6	100.0	100.0	96.9	92.4	82.0	78.0	77.6	70.9	75.4	78.5	82.5
Clay Products	60.7	65.3	120.0	154.3	82.9	105.7	100.0	96.5	97.0	91.7	86.1	78.0	70.6	71.1	75.7	79.3	83.2
Glass mfg	50.7	63.5	112.1	151.1	83.7	101.9	100.0	96.2	95.9	92.1	86.6	77.9	69.4	71.2	75.4	78.5	82.6
Paint mfg	50.2	62.8	108.0	148.5	84.1	104.0	100.0	94.1	94.6	91.7	85.7	76.6	71.7	70.1	74.6	77.2	81.5
Paper mfg	60.4	63.4	111.8	152.6	83.1	105.6	100.0	96.2	96.8	90.9	86.5	77.1	67.2	69.9	75.4	78.5	82.7
Petroleum Ind	58.9	64.1	113.0	151.5	82.7	106.0	100.0	96.5	97.1	92.0	86.2	77.6	70.1	70.6	76.0	78.7	82.6
Rubber ind	58.6	63.6	113.8	154.2	88.0	105.9	100.0	96.4	91.9	91.9	86.9	77.0	67.1	70.7	75.9	78.1	82.2
Related Industries																	
Elec. power equip	59.1	64.3	114.2	152.2	83.6	106.0	100.0	96.2	96.9	91.8	86.1	78.1	70.1	70.7	75.5	78.7	82.7
Mining, milling	56.8	62.9	111.9	149.9	82.8	105.6	100.0	96.7	97.2	92.9	86.7	76.8	67.6	80.0	85.6	88.5	92.4
Refrigerating	59.3	63.2	113.5	153.5	83.9	96.1	100.0	96.3	97.0	92.0	86.4	75.0	70.0	71.3	75.4	78.9	83.0
Steam power	59.1	64.3	114.8	152.2	82.7	106.1	100.0	96.4	96.9	91.8	86.2	28.1	70,1	70.7	75.5	78.7	82.7



		_															
	1953	1952	1951	1950	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940	1939	1938	1937
Average of all	182.5	180.5	180.9	167.9	161.2	162.8	150.6	123.2	103.4	102.4	100.5	99.6	92.6	86.6	84.8	84.4	188.3
Cement mfg.	174.6	172.8	179.7	161.6	156.6	156.5	144.3	119.7	99.4	98,6	98.3	97.8	90.8	85.4	84.6	85.2	88.8
Chamical	183.1	181.1	180.7	169.6	164.5	164.5	151.5	126.8	106.5	105.6	103.1	102.0	93.3	84.6	83.8	84.4	88.2
Clay products	169.5	167.7	167.7	156.6	:51.5	151.5	139.8	115.0	94.8	93.9	93.6	23.1	87.6	83.7	82.7	83.2	87.8
	173.0	171.0	170.8	159.7	154.6	154.6	142.3	117.6	97.4	96.5	94.7	93.7	84.2	84.3	83.0	83.4	88.0
Paint mfg.	176.3	174.4	174.0	162.9	157.8	157.8	146.0	121.2	101.0	100.1	98.3	97.3	90.3	84.9	83.9	83.9	87.4
Paper mfg.	176.6	174.7	174.3	163.2	158.1	158.1	147.0	122.4	102.2	101.3	98.7	97.5	90.5	85.1	84.1	84.8	88.1
Petroleum Ind.	179.7	177.6	177.1	166.0	160.9	160.9	147.2		100.9	100.0	96.7	95.2	88.2	82.8	82.3	83.3	87.8
Rubber	182.1	180.0	179.5	168.4	163.3	163.3	151.2	126.6	106.4		103.7	102.7	94.2	96.3	85.3	85.4	88.4
Elec, power equip.	184.9	182.8	182.3	171.2	166.1	166.1	150,0	122.9	100.2	99.3	97.5	96.5	90.5	85.8	84.1	84.3	87.9
Mining, milling	184.1	181.9	181.4	170.8	165.2	165.2	153.0	128.4	108.9	107.3	106.2	105.5	98.5	93.1	92.1	92.6	97.1
	202.8	200.7	200.1	185.2	175.8	176.7	162.2	125.7	101.7	100.1	97.0	95.8	89.0	83.1	82.1	83.0	87.5
Sleam power	179.6	179.5	169.9	158.5	153.2	153.2	141.7	116.0	94.8	93.9	92.8	92.1	86.6	82.7	81.7	82.2	87.0



New Instrument uses . . .



Old optical principle . .

How to Use Micro-Interferometry

You'll be able to make surface measurements that could only be guessed at

R. E. SUGG

What is the perfect metal surface? How smooth must color film emulsion be to prevent the defects from showing on the new wide screens and in 3-D techniques now in use at your neighborhood movie theater? How can we measure the characteristics of painted surfaces, which are usually fairly rough? The properties of the new synthetic fibers vary with the smoothness of the filament surface. How can this quality be controlled?

Chemical engineers are facing these problems today. And now there's a new instrument that will help them find some answers to these questions. The micro-interferometer is a little-known instrument which has high sensitivity to topographical measurement in the micro-region. The first published account of it was by Linnik in 1933. However, several years before this Michelson was working with ruling engines at the University of Chicago and had constructed a micro-interferometer with high-power magnification for use in this work.

R. E. Sugg reports on work performed in the Mechanical Research Section, Mechanical Development Laboratory, of E. I. du Pont de Nemour & Co., in Wilmington, Del. During World War II, Carl Zeiss produced the first commercial instrument of this type for the examination of surface detail in highly finished machine parts. A modified version is now sold by Carl Zeiss. Hilger & Watts, Ltd., and the Bausch & Lomb Optical Co. also have production models in the design stages.

Micro-interferometry is especially suited to examination of surface finishes on metals and will probably find widest appplication in this field.* However, other problems in microcontour measurement have yielded to this approach. Some of these are chemical engineering problems.

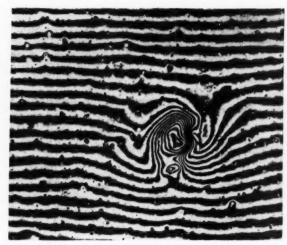
CHEMICAL ENGINEERING APPLICATIONS

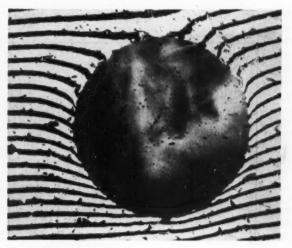
The finishing operation on a polished metal surface leaves some scratches. They are visible to the naked eye and contribute a fine patina to the surface. This is somewhat like the look that old marble, wood, and bronze have after long exposure. These scratches are so shallow that the use of a conventional stylus to trace their depths gives only a rough qualitative answer. Using a micro-interferometer for this measurement, we can detect rough spots which are only 1-millionth of an inch high.

Photographic films are no more perfect than is the polished surface of the roll or huge wheel on which they are cast. A flaw in the film, invisible to the eye, becomes glaringly visible on a motion picture screen. Vinyl films, as well as acetate, demand a high degree of perfection in the finish of their casting rolls.

When viewing color film emulsion through the micro-interferometer a large number of defects are in evidence which affect true color reproduction. The individual constituents vary from 5 to 20 microinches high.

Painted surfaces present a similar problem. In order to differentiate between a satisfactory and an unsatisfactory paint, it is necessary to measure the roughness. Small pigment particles of the black enamel, shown above, protrude from the mean surface about two fringes, or 20 microinches. This is enough to reduce the gloss of the finish. The large isolated particle in the center is 100 microinches high. Particles such as this, however, have little effect on the gloss because they are widely spaced. If a stylus had been used to trace this surface instead of a micro-interferometer, it would find only these larger particles.





Measures defects.

As a New Chemical Engineering Tool

before. Immediate applications are in paints, films, fibers and metals.

The surface contour of a filament of synthetic fiber is affected by solidification and drawing operations. In some cases the surface creases are amazingly regular, running from 40 to 60 microinches deep. For certain uses, these crenulations might be desirable; in others, they would not. Interferometric examination offers a basis for quality control.

Micro-interferometry lends itself naturally to precise measurement of edge sharpness since small areas may be highly magnified, and extreme sensitivity to depth is inherent in the fringe system. The last illustration above shows a drawtwister ring used in textile spinning. By counting fringes from the high spot to the low spot, we can see that the relative wear between these two areas is 245 microinches. The fiber passing through the spinneret will not wind properly on the spool.

Additional uses of micro-interferometery in the study of metals include the examination of crystal topography, crystal growth, micro-structure, and the evaluation of etching procedures.

HOW IT WORKS

All interferometers are the same in principle. They divide a beam of light

into two or more parts. The beams travel different paths and recombine to form interference fringes. The fringes (alternate light and dark bands) result from wave interference. This occurs whenever the two paths differ by a multiple of one-half the wave length of the light being used.

In our instrument, collimated monochromatic green light is filtered from a mercury vapor lamp. We split it with a partially silvered prism. Half the light passes through a microscope objective to a scratch-free reference mirror and then reflected back to the prism and the evepiece. The other half of the light is deflected by the prism onto the surface being examined. The reflection from this surface is reflected back to join the reference beam. The nominal path difference is controlled by the relative tilt between the two surfaces.

If both surfaces were perfect they would give parallel fringes and no bands would show. Usually the surface under examination will have some imperfections. This causes fringe deviations. We can measure these deviations.

The mercury green line has a wavelength of 5461 Angstrom units. Each band appears after a height variation

of ½ wavelength = 2730 A. The fringe spacing, therefore, shows elevation differences of 10.75 microinches. The difference in height between any two points on a micro-interferometer pattern, is found by counting the number of dark bands between them. Each band is about 10-11 microinches lower than the next.

Phase-contrast microscopy, a development of the last few years, uses phase-shift plates in the objectives to give enhanced image contrast.8 Interference contrast is achieved in our instrument by adjusting the reference mirror so that there is no relative tilt between surfaces. This way one fringe fills the field and slight elevation differences give light and dark areas delineating the different constituents in high contrast.

REFERENCES

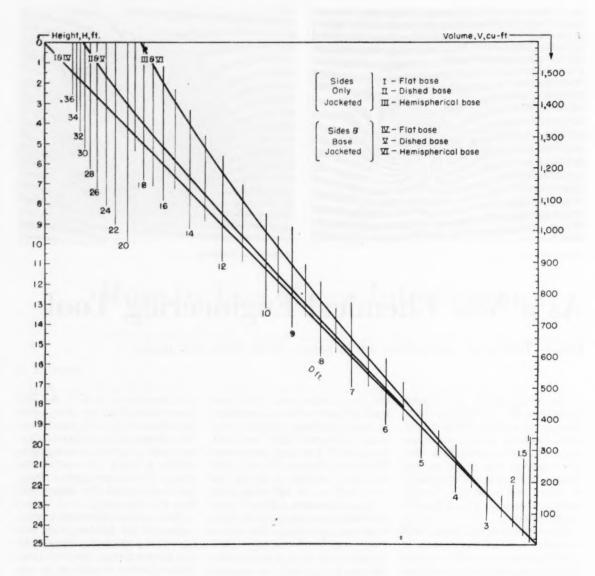
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Nomograph Simplifies Sizing

As volume, heat transfer area, and vessel shape change, you

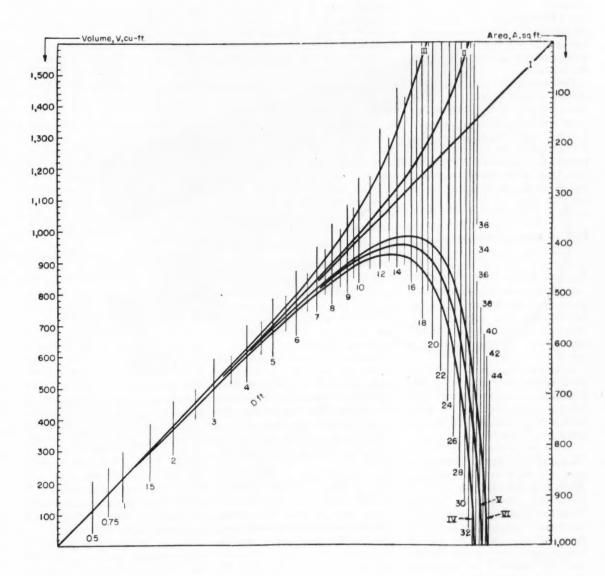
In the design of chemical plants, it is frequently necessary to size various jacketed vessels. Starting material for this procedure is the required capacity of the vessel, the over-all heat transfer coefficient between the fluid in the vessel and the fluid in the jacket, the temperature difference be-

tween the vessel and jacket fluids, and the required rate of heat transfer.

Combining the first three of these, $Q/(U\Delta t) = A$. Where Q = required rate of heat transfer (Btu./hr.), U = over-all coefficient of heat transfer (Btu./sq. ft.-hr.-deg. F.), $\Delta t =$ temperature difference between the vessel

and jacket fluids (deg. F.), and A = heat transfer surface (sq. ft.).

The required volume of the vessel taken with the heat transfer area calculated as above, give sufficient information to solve for the dimensions of the vessel, if the desired shape and the extent of jacketing are known.



of Jacketed Vessels

By F. BROWN and K. G. BURRIDGE

can pick off corresponding dimensions from these alignment charts.

The vast majority of jacketed vessels of interest to chemical engineers are vertical cylinders with flat, dished or hemispherical bottoms. Jackets are used on the sides and base, or on the sides only. Occasionally you'll find a vessel with a conical base or a hemispherically based vessel with a jacket

on the bottom only. The nomograph above is derived for the general case of a vessel whose upper part is a vertical cylinder. The shape of the base depends on the diameter of this cylinder and not upon its vertical height. Six combinations of bases and jackets are considered.

The ratio of volume to surface area for a geometrical shape is not dimensionless. It has the dimension of length and will vary with the actual dimensions of the vessel. This may prove to be significant if your scale-up from pilot plant to production equipment depends solely on geometric

similarity. Also, a cylindrical vessel with a hemispherical base, jacketed on the sides and base, will have a smaller heat transfer area than the same vessel correspondingly jacketed but with a flat bottom.

The nomograph permits a quick analysis of both of these effects. It shows for each of the six cases, the range of cylinder diameters to which a vertical height can be assigned that will satisfy both the capacity and heat transfer area conditions. It also shows how these permissible diameter and vertical height ranges change if you vary the shape of the base or the extent of jacketing.

How to Use the Nomograph

Given the volume, the jacketed surface area, and the shape of the vessel the procedure is:

1. On the right side of the nomograph, select the D-curve appropriate for the vessel shape and read off the value of D in ft. by lining up a straight edge between the given values of A and V.

2. Transfer the value of D obtained from the right-hand chart to the left-hand page. Lining up a straight edge between the D-point and the given value of V, you can read off the corresponding height, H.

In the case of D-curves IV, V, and VI, either two values of diameter or none will be found by alignment. When two diameters are found it means that for any value between them there is no corresponding height which can be assigned that will satisfy the requirements for volume and heat transfer area. If no diameter lines up, then any value of D can be used on the left hand nomograph to determine the height. The corresponding value of A will always be larger than the given required area. This is on the safe side.

When only volume and jacket surface area are given initially, the nomograph can be used to find the most

Frank Brown and Kenneth Burridge are senior chemical engineers at the research center of the Dunlep Rubber Co., Birmingham, England. In 1950, our authors were awarded scholarships sponsored by the Mutual Security Agency for study in the U.S. Both obtained M. Ch. E. degrees at Brooklyn Polytechnic Institute in 1953.

convenient vessel shape. Alignment of a straight edge between given values of A and V on the right-hand half of the chart, will intersect all or some of the D-curves. Corresponding values of H for each value of D are found on the left-hand side. Then, the vessel can be selected from the diameter and height value pair that best satisfies the general requirements.

In addition to specifying the volume and area required, the designer must consider the limit imposed on the *II/D* ratio for practical reasons. Will the vessel be agitated? What headroom and floor space are available? The following examples will illustrate the use of the nomograph in these cases.

Sample Problems

Example 1—A cylindrical flat bottomed vessel with sides only jacketed (D-curve 1) is to have a capacity of 1,000 cu. ft. and the required cooling area is 500 sq. ft. What will the height and diameter be?

Solution—Line up a straight edge on the right-hand side of the nomograph between V=1,000 and A=500. This intersects the D-I curve at D=8.0 ft. Place the straight edge on the left-hand side chart at V=1,000 and D=8.0 ft. On the D-I curve, H=19.95 ft. Let's check this quickly. $V=(\pi D^{\circ} H)/4=(3.14)$ $(8\times8)(19.95)/4=1,002$ cu. ft.; and $A=\pi DH=(3.14)(8)(19.95)=500.5$ sq. ft.

Now let's put some other restrictions on our design. A vessel is required of the same capacity but the H/D ratio is either 2 or 3. The cooling area must not be less than 500 sq. ft.

The first restriction is an impossible requirement. The diameter of 8.0 ft. found on the diagram is the maximum value of D compatible with the cooling area requirement. The minimum H/D ratio is 19.95/8.0 = 2.49.

Now for an H/D ratio of 3, let's use the minimum diameter, 8.0 ft., as a starting point on the left-hand nomograph. Place a straight edge so that one end lies on V = 1,000 and it cuts the D-I curve at D = 8.0. Rotate the straight edge downwards (counterclockwise) with V = 1,000 as the center of rotation. By inspection, H/D = 3 at D = 7.5 ft. and H = 22.5 ft. But the area is no longer 500 sq. ft. Going back to the right-

hand side, we see that A is now 530 sq. ft. These answers can be checked as we did above.

Example 2—A dished base vessel with sides and base jacketed is required. The volume is to be 1,180 cu. ft. and the cooling area requirement is 550 sq. ft.

Solution—We shall use D-curve V. From the right-hand side nomograph we see that there are two values of D which satisfy the conditions. D = 9.8 or 23.2 ft. Between these two limits there is no compatible answer which meets the given requirements.

From the left half with V = 1,180 and D = 9.8, read H = 15.2 ft., and with V = 1,180 and D = 23.2, read H = 12 ft.

To check this, $V = (\pi D^3 H)/4 + 0.0172\pi D^3 = 1,189.9$ cu. ft. using one set of values and 1,182 cu. ft. for the other. Similarly, the area is either 547.9 or 542 sq. ft. depending on which height-diameter pair is used.

If we specify certain H/D ratios, as we did in Example 1, the solution is found in the same way. For a vessel similar to the one in Example 2 but with a H/D ratio of 1.0 and 2.0, what dimensions are possible if the cooling area is to be larger than 550 sq. ft.?

The H/D ratio of 1.0 is impossible because the limits in this case are 15.2/9.8 = 1.55 and 1.2/23.2 = 0.0516. Between these two limits it can be shown mathematically that there is no positive value of H and D which will yield a cooling area equal to or greater than 550 sq. ft. for a capacity of 1,180 cu. ft.

On the left-hand diagram, starting with one edge on V = 1,180 and D = 9.8 on the D-curve V, rotate the straight edge in a counterclockwise direction around V = 1,180 until, by inspection, the value of H/D = 2.0. This occurs at D = 9.0 ft. and H = 18.0 ft.

The area can be found by checking the right-hand chart at V = 1,180 and D = 9.0. This gives a value of **A** at 580, which meets the requirements.

ACKNOWLEDGEMENTS

The authors wish to thank the Dunlop Rubber Co. for permission to publish this paper. They are indebted to Mr. E. G. Nicholls, Drawing Office of General Development Division for assistance in preparing the drawings.

ACE PARIAN° NEW chemical pipine

ODORLESS ON NON-TOXIC

PHYSICAL CHARACTERISTICS:

Specific Gravity — 1.12

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Resistance to Cold Flow—Excellent

Deformation Under Load at 122°F — 0.6%

Impact Strength — Izod 32 ft. lbs./in. notch

Resistance to Continuous Heat, no load—212°F

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Coeff. Thermal Expansion/Deg. F—9x10-8

Resistance to Sunlight — Excellent

Water Absorption — 0.04-0.06%

Elongation — 100-200%

chemical

resistance

at 77 deg. F.

No other chemical piping offers such a remarkable combination of chemical resistance, high impact strength, and easy workability as new ACE Parian. Formed of Polyethylene with all the skill of American Hard Rubber Company's 101 years of specialized experience, it is ideal wherever both the interior and exterior of the pipe are exposed to corrosion. Odorless and nontoxic, it's also good for foods and beverages.

All standard pipe sizes from ½" to 2". Standard lengths of 10 feet. It's easy to thread with standard dies, and a complete line of molded Ace Parian fittings are available.

Why not glance over the physical characteristics and specific reagents at right, and see how many places in your plant this new pipe can save for you!

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EXCELLENT.

Sulfuric Acid, 10-30% Colcium Chloride, 15% aq Calcium Hypochlorite "Duponol" ME, 10% aq. Tristhanalomine Ferric Sulfate, 15% aq. Saturated Salt Water

600D:

Sulfuric Acid, 60% concentrated Hydrochloric Acid, conc. (10-37%) Sodium Hydroxide, 10-50% Ethyl Alcohol (denatured)

Ethyl Alcohol (densiture Acetone Formic Acid Hydroflouric Acid, 48%

FAIR

Hitric Acid, 10% Acetic Acid, 10% Ammonium Hydroxide, 10-28%

Dioxane Xylene

Sodium Bisulfite Linseed Oil POOR:

Henzene Ethylone Dichtorido Butyraldehyde

UNSUITABLE

Nitric Acid (Conc. 70%) Acetic Acid, glacial Oleic Acid, conc. Most Chlorinated solvents Lubricating Oil Ethyl Acetote



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Chemical Engineering Fundamentals

Chemical Equilibrium—I

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Our next three installments will deal with chemical reactions. This first section will involve only the first law considerations i.e., what are the energy effects if the reaction takes place? The question of whether the reaction will proceed or not doesn't enter—only what happens if it does. Later sections will be concerned with the second law of thermodynamics—how to find out if the reaction will take place under a given set of conditions.

If we have an off-gas from a chemical process, can we dispose of it in a flare? Can we recover some of its heat by burning it? Yes, if its flame temperature is high enough to sustain combustion. And to determine this we would want a simple way to estimate its theoretical flame temperature.

Is a mixture of carbon monoxide (or any other gas) and air explosive? Can a possible explosion be contained in equipment designed to withstand the maximum pressure developed by the explosion? To answer these questions we would have to calculate the theoretical explosion pressure of a mixture. Both flame temperature and explosion pressure calculations are only special cases of a heat of reaction calculation.

Chemical Reactions

The three important things that a chemical engineer wants to know about a chemical reaction are:

- How fast will it go?
- · How far will it go?
- How much heat will be given off or absorbed?

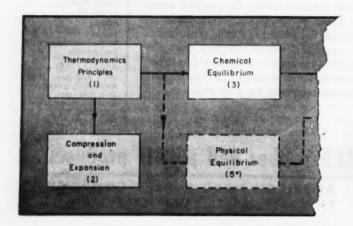
The first question involves rates and falls within the field of kinetics. The other two can be answered from thermodynamic considerations.

In fact, the prediction of chemical reaction equilibria and the calculation of heat of reaction are two of the most useful aspects of thermodynamics. We are able to calculate these quantities for a given reaction from data taken on other reactions or from thermal data on the individual substances involved.

Heat of Reaction

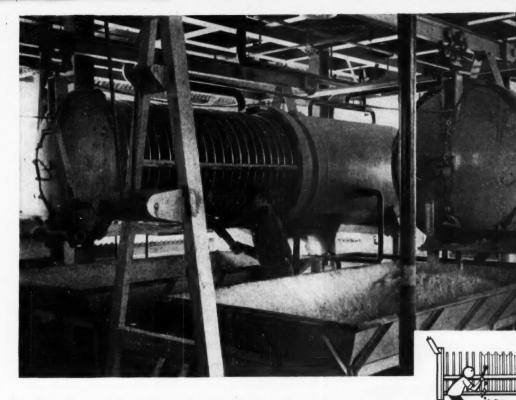
When a chemical reaction takes place there is usually an evolution or absorption of heat. This is because the absolute enthalpy of the products of a reaction is usually quite different from that of the reactants, even when both are at the same temperature. The amount of heat absorbed is called the heat of reaction and is equal to the enthalpy change of the reaction. In an exothermic reaction, the enthalpy of the products is less than that of the reactants, and heat is evolved. An endothermic reaction is one in which the enthalpy of the products is greater than that of the reactants. Heat is absorbed by the reaction in this case.

We must specify a definite temperature and the



Where We've Been-In Sept., Oct. and Nov. 1953 we took a sightseeing trip through Thermodynamics Principles. Dr. Thomas E. Corrigan was our expert guide. Then we detoured a bit to take a longer look at Compression and Expansion. Here Al Johnson served us well as co-author.

Where We're Going-Now Tom Corrigan takes us back onto the main road of thermodynamics. We'll discuss chemical equilibrium, whether a chemical reaction will or will not take place and if the reaction goes, what else will happen.



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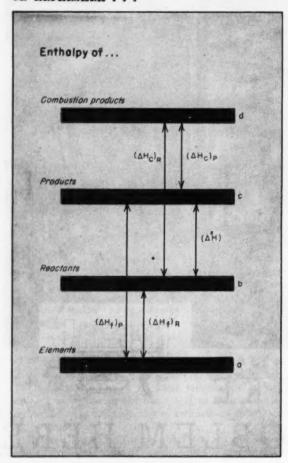


Fig. 1-Chart for enthalpy levels in reactions.

physical state for each component when designating the heat of reaction. These specified physical states are called standard states. and the corresponding heat of reaction is known as the standard heat of reaction. We find that 18 deg. C. is most often specified as the temperature level of the standard heat of reaction.

The standard states of pure gases and liquids are commonly chosen as 1 atm. pressure and the temperature of the system. For dilute solutions, or for ions in solution, the standard state is a hypothetical one. It is based on the behavior of the solute in an infinitely dilute solution.

The physical state of the materials involved in the reaction is an important factor affecting the value of the standard heat of reaction. The following equation will have one standard heat of reaction when written

$$C_2H_4(g) + 2O_1(g) \rightleftharpoons 2CO_2(g) + 3H_2O(l)$$

Here $\Delta H_{10} = -372,830$ cal./gm.-mole of ethanc. The value is quite different when the equation is written

$$C_1H_4(g) + 2O_1(g) \rightleftharpoons 2CO_1 + 3H_1O(g)$$

Here $\Delta H_{10} = -341,135$ cal./gm.-mole of ethane.

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Why are they different? Simply because in the first case we have liquid water as a product. But in the second

case, our product is a mixture of carbon dioxide and steam. The difference is the heat of vaporization for the three moles of water formed.

Heats of reaction can be calculated from heats of formation, heats of combustion, or from heats of other reactions which involve the same compounds. The heat of formation of a compound is its enthalpy relative to that of its elements at the same temperature. For example, in the equation

$$C(s) + 2H_1(g) \rightleftharpoons CH_4(g)$$

 $\Delta H_{18} = -17.865 \text{ cal.}$

the heat of formation of methane is 17,865 cal./gm.-mole. The heat of combustion of a compound is the enthalpy change of the reaction involving its complete combustion.

$$CH_4(g) + 2O_2(g) \rightleftharpoons CO_2(g) + 2H_2O(g)$$

 $\Delta H_{13} = -212,800 \text{ cal.}$

The heat of combustion of methane is 212,800 cal./gm.-mole.

We can calculate the standard heat of reaction by taking the difference between the heats of formation of products and reactants.

$$\Delta H = \Sigma (\Delta H_f)_P - \Sigma (\Delta H_f)_R \qquad (1)$$

For many compounds (especially organic), we do not know what the heat of formation is but we do know the heat of combustion. The heat of reaction can be calculated by subtracting the heats of combustion of the products from those of the reactants.

$$\Delta H = \Sigma (\Delta H_e)_B - \Sigma (\Delta H_e)_P \qquad (2)$$

We could also make this calculation by combining

NOMENCLATURE (Consistent units)

	a,b,c,d,e,f	Reference points on Figs. 1 and 2
	a',b',c',a",b"	Reference points on Fig. 2
	C,	Heat capacity at constant pressure
	C_{pm}	Mean heat capacity at constant pressure
	C.	Heat capacity at constant volume
	d	Differential operator
	(A)	Standard state, gas
	H	Enthalpy
	ΔH	Change of enthalpy for a reaction
	ΔH_{10}	Heat of reaction at 18 °C (usually standard)
	Δ He	Heat of combustion
	ΔH_f	Heat of formation
	ΔH_8	Heat of reaction at standard temperature, T
	ΔH_T	Heat of reaction at temperature T
	(1)	Standard state, liquid
	n	Number of moles
	p	Pressure
	R	Universal gas constant
	(s)	Standard state, solid
	T	Absolute temperature, °K. or °R.
	$T_{\mathcal{S}}$	A standard temperature
	U	Internal energy
	U_S	Internal energy at standard temperature, Ta
	Δ	Finite change in a property
	Σ	Summation of
4	Additional subs	cripts
	P	Of the products

Of the reactants



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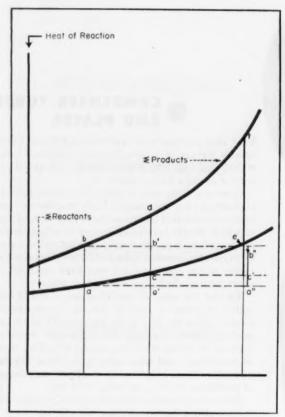


Fig. 2-Enthalpy of products and reactants vs. T.

equations for which the heats of reaction are already known. To calculate the heat of any reaction, merely add up the equations for reactions having known values of ΔH so that their sum gives the reaction desired. For the case below, if the heats of reaction for (3) and (4) are known, the heat of reaction of (5) is the sum of (3) and (4).

(3)
$$C(s) + \frac{1}{2}O_1(g) \rightleftharpoons CO(g) \Delta H_1 = -26,620 \text{ cal.}$$

(4)
$$CO(g) + \frac{1}{2}O_1(g) \rightleftharpoons CO_1(g) \Delta H_4 = -67,410 \text{ cal.}$$

(5)
$$C$$
 (a) + O_1 (g) \rightleftharpoons CO_1 (g) \triangle H_4 = -94,030 cal.

Heat of reaction data are available in the literature, usually as tabulations of either the heat of formation or the heat of combustion. These are for the individual compounds in their standard states. For inorganic compounds, the heat of formation is usually reported, while the heat of combustion is usually given for an organic compound.

We can visualize Eqs. (1) and (2) easily by assuming the enthalpy levels of the reactants, products, elements, and combustion products. This is shown diagrammatically in Fig. 1.

Also,
$$\Delta H = cb = ac - ab = (\Delta H_I)_P - (\Delta H_I)_R$$
$$\Delta H = cb = bd - cd = (\Delta H_I)_R - (\Delta^{\bullet}H_I)_R$$

Heat of Reaction Changes With Pressure

Although we specify both temperature and pressure in designating the standard state for the reaction, the change of heat of reaction with pressure is usually small and often is neglected. For ideal gases the heat of reaction is not affected by pressure. For liquids and solids there is some slight effect, but it is so small that it may be ignored in most cases. But when we consider reactions that involve non-ideal gases at high pressures, the effect of pressure upon heat of reaction may be significant. The actual ΔH may be different from the standard heat of reaction at 1 atm. and standard states.

Heat of Reaction Changes With Temperature

The effect of temperature on the heat of reaction may be considerable and cannot be ignored in most cases. This is especially true when reactions occur at high temperatures. We can calculate this change as follows:

$$\Delta H_T = \Delta H_S + \int_{-T_\sigma}^T C_p dT \qquad (8)$$

where ΔH_{τ} is the heat of reaction at temperature T; ΔH_{s} is the standard heat of reaction at T_{s} ; T_{s} is the standard temperature; and ΔC_{s} is the difference between the sum of the heat capacities of the products and that of the reactants.

Eq. (8) may be simplified by using mean heat capacities where ΔC_{pm} is the difference between the mean heat capacities of the products and reactants.

$$\Delta H_T = \Delta H_S + \Delta C_{pm} (T - T_S)$$
 (9)

We use the calculated heat of reaction at a given temperature to calculate an energy balance over the process in which the reaction occurs, and to calculate the equilibrium constant of the reaction.

We are most interested in four kinds of heat of reaction calculations.

Case I—The reactants enter and products leave at the temperature for which we have given heat of reaction data (the standard temperature).

Reactants
$$\longrightarrow$$
 Products (at T_S) (at T_S)

The enthalpy change for this case is the standard heat of reaction that was discussed above.

Case II—The reactants and the products are at the same, but not at the standard, temperature.

Reactants
$$\longrightarrow$$
 Products (at T_1) (at T_1)

The enthalpy change here (ΔH_{τ}) is the heat of reaction at temperature T_1 .

Case III—The reactants enter at T_1 and the products leave at T_2 .

Reactants
$$\longrightarrow$$
 Products (at T_1) (at T_2)

Case IV—This is the same as Case III except that the process is considered adiabatic, that is, $\Delta H=0$. Here T_2 is an unknown value. This is the case encountered in calculation of theoretical flame temperatures.

The most direct method for evaluating any of the



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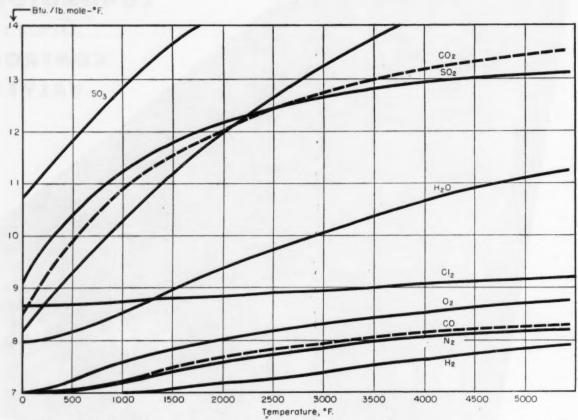


Fig. 3-Mean molal heat capacities of gases at constant pressure conveniently evaluated between 65 deg. F. and T (from Ref. 2).

above four cases is to use a graph on which the total enthalpy of the products and the total enthalpy of the reactants are plotted as ordinates against temperature as the abscissa. Fig. 2 is such a plot. Note that the enthalpies of both products and reactants are referred to the same datum plane, which may be that of any one of the products or reactants.

In Fig. 2 let T_s be the standard temperature (that for which the heat of reaction is known). T_1 and T_2 can be any arbitrary temperatures. In Case I the reactants enter at T_s and the products leave at T_s . Therefore the enthalpy change is represented by ab, the standard heat of reaction.

In Case II the reactants enter at T_1 (point c) and the products leave at T_1 (point d). The enthalpy change for this process is represented by segment cd. This is also the heat of reaction at T_1 . We can see from Fig. 2 that

$$cd = a'b' + b'd - a'c \tag{10}$$

But a'b' is equal to ab and is the standard heat of reaction; b'd is the enthalpy change in raising the products from T_a to T_i ; a'c is the enthalpy change in raising the reactants from T_a to T_i . Therefore we can rewrite Eq. (10):

$$\Delta H_T = \Delta H_S + \int \frac{T_1}{T_S} \sum (C_p)_P dT - \int \frac{T_1}{T_S} \sum (C_p)_R dT \quad (11)$$

where $\Sigma(C_p)_p$ is the sum of heat capacities of all the

reaction products, and $\Sigma(C_p)_B$ is the sum of the heat capacities of all the reactants entering the reaction.

Since the limits of both integrals are the same in Eq. (11), we can also write

$$\Delta H_T = \Delta H_S + \int_{-T_S}^{T} \Delta C_p dT$$
 (12)

where,

$$\Delta C_p = \Sigma (C_p)_P - \Sigma (C_p)_R$$

It may be more convenient to use the mean heat capacity between T_s and T_t when we evaluate Eq. (11), in which case the equation could be written,

$$\Delta H_T = \Delta H_S + \Delta C_{pm} (T_1 - T_S)$$

For Case III the reactants come in at temperature T_1 and the products leave at T_2 . The enthalpy change for the whole process is the difference between the enthalpy at c and at f and is equal to c'f. We can see from Fig. 2 that

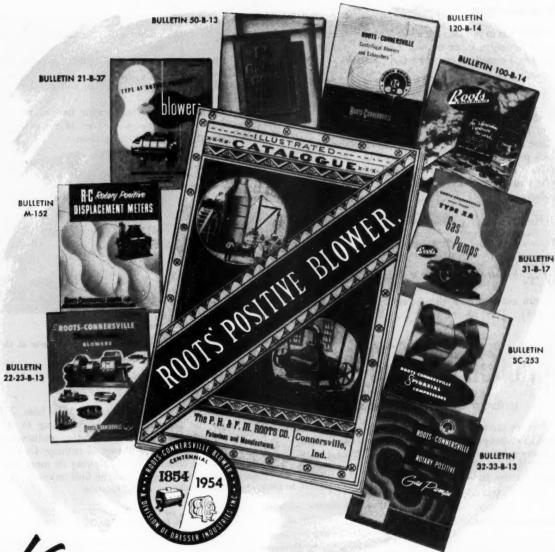
$$c'f = a''b'' + b''f - a''c'$$
 (13)

But.

$$c'f$$
 = the ΔH that is sought $a''b''$ = the standard heat of reaction

And b''f is the enthalpy change in raising the products from T_s to $T_{z'}$. Therefore Eq. (13) becomes

$$\Delta H = \Delta H_S + \int \frac{T_s}{T_1} \Sigma (C_p)_P dT - \int \frac{T_1}{T_S} \Sigma (C_p)_R dT \quad (14)$$



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Notice that in this case the upper limits of the integrals are not the same, so we can not use ΔC_p . If mean heat capacities are used we can write this equation:

$$\Delta_{b}^{g}H = \Delta_{a}^{g}H_{S} + \Sigma_{a}^{*}(C_{pm})P_{a}^{*}(T_{1} - T_{S}) - \Sigma_{b}^{*}(C_{pm})R^{*}(T_{1} - T_{S}) \quad (15)$$

It should also be noted here that the mean heat capacities of reactants and of products are taken over different temperature ranges-Ts to T1 for reactants and T_a to T_a for products.

Case IV involves the calculation of the temperature at which products leave an adiabatic reaction. It is similar to Case III. The only difference is that we assume ΔH to be zero and then solve for T2, the temperature of the

$$\Delta H = \Delta H_S - \int \frac{T_s}{T_S} \Sigma (C_p)_F dT + \int \frac{T_1}{T_S} \Sigma (C_p)_R dT = 0$$

$$\int \frac{T_s}{T_S} \sum (C_p)_P dT = -[\Delta H_S - \int \frac{T_1}{T_S} \sum (C_p)_R dT \quad (16)$$

We can evaluate both the second and third terms in Eq (16). Then we can write

$$\int_{T_{\mathcal{S}}}^{T_{\mathfrak{s}}} \Sigma (C_{\mathfrak{p}})_{P} dT = N$$

where,

$$N = -\Delta H_S - \int \frac{T_1}{T_S} \Sigma (C_p)_{R_*} dT$$

Then we can solve for T_s either directly or by trial and error. The use of mean heat capacities leads to the trialand-error solution via:

$$\Sigma (C_{pm})_P (T_s - T_s) = N$$

Where,

$$N = -\Delta H_S - (C_{pm})_P (T_1 - T_S)$$

Theoretical Flame Temperature

The calculation of the theoretical flame temperature is a special application of Case IV. Here we assume that the combustion process is so fast that there is no time for the heat to be transferred away from the flame. Then the process is adiabatic and all the energy released by the combustion process is absorbed by the products.

The theoretical flame temperature is the temperature at which the products of combustion leave an adabatic process. If the effect of dissociation is neglected, T2 can be calculated in the same manner as above. Calculated theoretical flame temperatures, using this method, differ from the measured ones by less than 10 percent. If further refinement is desired, we can include the effect of dissociation. This subject is on our agenda for future discussion under the heading of chemical reaction equili-

Theoretical Flame Temperature Problems

Example 1-Calculate the theoretical flame temperature of carbon monoxide in air.

Solution—The theoretical flame temperature in air is the maximum temperature that would be obtained with the complete combustion of the gas in the stoichiometric

quantity of air with no heat transfer. The procedure will

(1) Determine stoichiometric quantities of reactants and products.

(2) Calculate the heat of reaction and enthalpy of the reactants.

(3) Calculate at which temperature the enthalpy of the products will be equal to the sum of the enthalpy of the reactants and the heat of reaction.

Equation:
$$CO + \frac{1}{2}O_1 \longrightarrow CO_1$$

Basis 1 lb.-mole of COMoles of O_1 required 0.5 Moles of N_1 required 0.5(79/21) = 1.88

Reactants:	CO N ₂ O ₃	1.00 mole 1.88 0.50
	Total	3.38 moles
Products:	CO ₂	1.00 mole 0
	N_{*}	1.88
	Total	2.88 moles

$$\Delta H = \Delta H_{99} - \Sigma H_B + \Sigma H_P$$

 $= \Delta H_{\rm SM} - \Sigma H_R + \Sigma H_P$ = 0 (adiabatic process) $= -122,000_a \text{Btu./lb.-mole}$ $= 0 \text{ (It is assumed that the reactants enter at the content of the content$ ΔH_{200} datum temperature) $-122,000 - 0 + \Sigma H_P$

0 Therefore,

 $\Sigma H_P = 122,000$ Btu./lb.-mole of CO consumed

The next step is the calculation of ΣH_P from 291 deg. K. to the final temperature. Switching to the Fahrenheit scale, we assume that all the products are formed at 65 deg. F. The change of enthalpy for each product can be obtained by multiplying its mean heat capacity between 65 deg. F. and the final unknown temperature by the change in temperature.

$$\Sigma H_P = (1.0) \ (C_{pm} \ {
m for} \ CO_3) \ (T-65 \ {
m ^\circ F.}) + (1.88) \ (C_{pm} \ {
m for} \ N_3) \ (T-65 \ {
m ^\circ F}) = 122,000$$

We can solve for T by trial and error, using the arrangement below. Charts of mean molal heat capacities between 65 deg. F. and any other temperature are available in the literature. See Fig. 3.

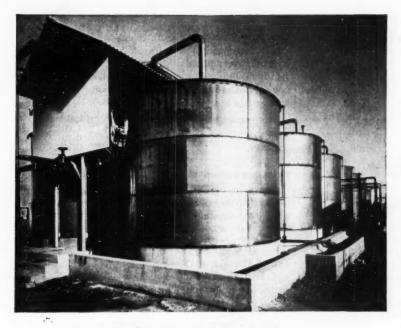
$$T-65=122{,}000/[(C_{pm}~{\rm for}~CO_{\rm s})+(1.88)~(C_{pm}~{\rm for}~N_{\rm s})]$$
 $T=(122{,}000/\Sigma C_{pm})+65~{\rm ^oF}.$

T	C_{zom}	C_{pm}	$(1.88) (C_{pm})$	ΣC_{pm}	T
(assumed)	(CO_2)	(N_3)	(N_2)	, , ,	(calc.)
1.000 °F.	10.9	7.3	13.7	24.6	5,040 °F.
4.500 °F.	13.0	8.2	15.4	28.4	4.365 °F.
4 285 °F	19 0	29	15.4	98 2	4 365 °F

The theoretical flame temperature calculated in this manner is 4,365 deg. F. Actually at this high temperature the CO2 would be partially dissociated and the temperature calculated taking this into account would be slightly lower, about 4,100 deg. F.

Example 2—What would be the lowest concentration of CO in air which would be combustible?

Solution—This problem is a further application of the use of flame temperature calculations. The theoretical flame temperature is calculated for various compositions and plotted against composition. The composition at which the flame temperature exceeds the kindling point of the gas is minimum combustible composition (See



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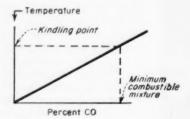
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below). The details of the calculation are the same as for Example 1, except that more cases must be worked out.



Incomplete Reactions

It is notable that in all of the previous discussions the term reactants was used to refer to all the material entering the process and products referred to all materials leaving the process. If an inert gas such as nitrogen went through the process unreacted, it was classified as a reactant when entering and a product when leaving. This is merely a matter of terminology and need not cause confusion.

If a reaction is only partially complete, the portion of the reactants which do not react may be treated in the same manner. But we must apply heat of reaction only to the number of moles which actually react.

Theoretical Explosion Pressure

By employing methods similar to those used for the calculation of theoretical flame temperature we can also calculate a theoretical explosion pressure. Here we assume that the combustion mixture burns so fast that the increase in volume is much slower than the rate of combustion and therefore pressure is generated. Since the process is assumed to take place at constant volume, the heat released by the reaction is equal to the change in internal energy, ΔU , rather than ΔH ; and the heat capacities used should be at constant volume, C, rather than C,.

If we assume ideal gas behavior, $\Delta U = \Delta H - \Delta nRT$ and $C_r = C_\rho - R$. Also, if we assume the process to be both adiabatic and at constant volume,

$$\Delta~U = 0 = \Delta~U_S + \int \frac{T_*}{T_S}~\Sigma~(C_*)_P~dT - \int \frac{T_*}{T_S}~\Sigma~(C_*)_R~dT$$

T₂ can be solved for in the same manner as the theoretical flame temperature.

With the assumption of ideal gas behavior the explosion pressure can be solved for by assuming the volume to remain constant at the volume occupied by the reactants.

We must emphasize that an explosion temperature and pressure calculated in this way is a limiting case and is approached only when we have infinitely high reaction rates. But the calculation is valuable in determining the relative explosive potential of various gas mixtures.

Theoretical Explosion Pressure Problems

Example—Calculate the theoretical explosion pressure of a 50 percent mixture of carbon monoxide in air.

Solution-We'll assume the explosion to be at constant volume and adiabatic. The temperature will be calculated under these conditions. Then the pressure will be estimated from ideal gas laws. We'll use I mole of CO in the original mixture as our basis of calculation. The original mixture has the following composition:

CO	50		Moles 1.00
~ ~	39.5		0.79
N ₁			
O_1	10.5		0.21
		Total	2.00
Products of reaction	$CO + 1/O_0 -$		CO.

One mole of CO will require 1 mole of O2. This means that there is an insufficiency of oxygen and oxygen will be the limiting reactant.

$$\begin{array}{ccccc} CO & + \frac{1}{2}O_1 & & & & & & & \\ 1.0 & 0.5 & & & & 1.0 & (Theoretical) \\ 0.42 & 0.21 & & & 0.42 & (Actual) \end{array}$$

Only 0.42 moles of CO react. Our product composition will be CO, 0.58 moles; CO₂, 0.42 moles; N₈, 0.79 moles; and no oxygen, to give a total of 1.79 moles.

$$\begin{array}{lll} \Delta \ U = 0 = \Delta \ U_S + \Sigma \ U_P - \Sigma \ U_R \\ \Delta \ U = \Delta \ H - \Delta \ nR \ T \\ \Delta \ H = - \ (0.42) \ (122,000) = - \ 51,200 \ \mathrm{Btu./lb.-mole} \\ \Delta \ n = 1.79 - 2.00 = - \ 0.21 \ \mathrm{moles} \\ R = 1.99 \ \mathrm{Btu./lb. mole} \\ T = 291 \ ^{\circ}\mathrm{K} = 525 \ ^{\circ}\mathrm{R} \end{array}$$

Therefore,

$$\Delta nRT = (-0.21) (1.99) (525) = -219$$
 Btu.
 $\Delta U = -51,200 - (-219)$
 $= -51,000$ Btu./lb. mole of CO in original mixture
Since we are assuming that reactants are at the datum

Since we are assuming that reactants are at the datum temperature, $\Sigma U_R \Sigma U_P$

The theoretical temperature is 3,925 deg. F. We started with 2.00 moles of gas. This means that the initial volume was 2(359) = 718 cu. ft. Then the final volume that would be occupied if the pressure remained at 1 atm.:

$$1.79 (359) \left(\frac{3.925 | + 460}{65 + 460} \right) = 5.380 \text{ cu. ft.}$$

And,

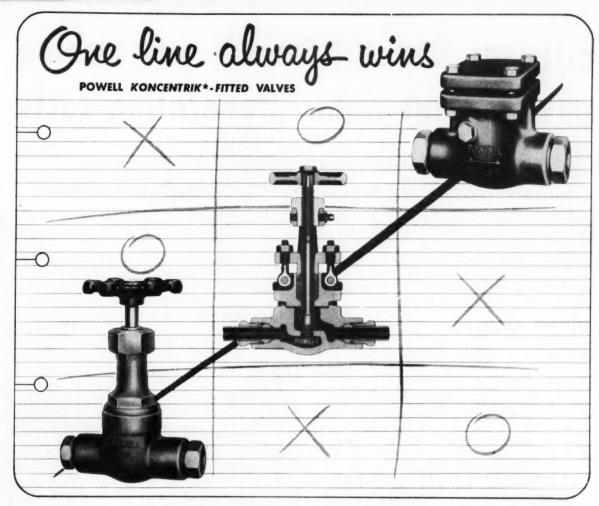
3,925

$$p_1 = 1$$
 atm. $(5,380/718) = 7.5$ atm. (96 psig.)

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Next Month-Chemical Equilibrium-II will discuss free energy, equilibrium constant, equilibrium composition, and fugacity.



TOP

KONCENTRIK-FITTED 300-POUND STAINLESS STEEL SWING CHECK VALVE (Fig. 2345-K). Bolted cap. Metal or Teflon (on order) discs are hung on a 5° angle. For corrosion-resistant tubing up to 1" O.D.

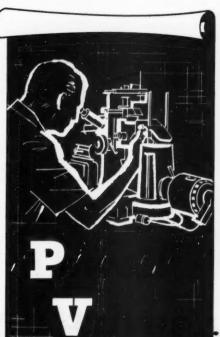
CENTER

KONCENTRIK-FITTED 300-POUND STAINLESS STEEL GLOBE VALVE (Fig. 2446-K—Sectional). Bolted bonnet; outside screw stem and yoke. Stem rises through bushing in upper voke.

BOTTOM

KONCENTRIK-FITTED 200-POUND STAINLESS STEEL GATE VALVE (Fig. 1832-K). Screw-in bonnet, inside screw rising stem. Solia wedges regularly furnished; split wedges on special order. For corrosion-resistant tubing up to 1" O.D.

*Trade Mark Reg. U.S. Pat. Off.



You're always the winner when you choose Powell Koncentrik-Fitted Valves for positive leakproof control of corrosive fluids in corrosion-resistant tubing installations. They are especially adapted for instrument lines and for installations requiring thin wall tubing, such as Schedule No. 5 or 10.

The William Powell Company has exclusive rights to use Koncentrik Fittings (the patented full floating seat and tube nut) in connection with Powell Corrosion-Resistant Valves. Based upon an entirely new principle in design, the pipe ends are designed to accommodate the seat and tube nut without the necessity of screwing separate fittings into the valve body.

Powell Koncentrik-Fitted Valves are available in Stainless Steel alloys (304, 316 and 20), Monel Metal, Nickel and Aluminum; and in a wide variety of types—Globe, Gate, Check, Needle and "Y" Valves. If a distributor is not located near you, write us for illustrated circular.

108th YEAR

THE WM. POWELL COMPANY . CINCINNATI 22, OHIO

Efficient General Electric gas turbine power plant reduces operating costs

Utilizing exhaust-heat-recovery boiler, G-E unit can attain
70% thermal efficiency, provide up to 120,000 lbs/hr process steam

Improved heat balance, elimination of separate boiler facilities, and a steam supply of up to 120,000 pounds per hour—with supplementary fuel firing—make the General Electric combustion gas turbine an efficient, economical prime mover for plants requiring considerable amounts of steam for process or other plant uses. Even without supplementary fuel firing, 40,000 pounds of steam per hour can be generated.

Well suited for either 5000 kw generator or 6700 hp mechanical drive for blowers and compressors, the

G-E turbine offers these advantages:

Proven in actual service, over 130,000 operating hours—equivalent to more than 15 years—have been accumulated by G-E gas turbines in industry.

Simple building construction is possible because the unit is small in size and weight.

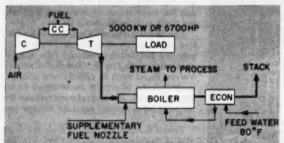
Lower operating costs resulting from:

 high power plant efficiency with exhaust heat utilized to supply plant steam and heat.

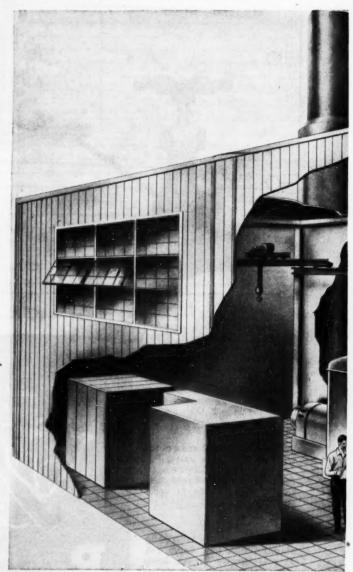
 reduced maintenance due to inherent simplicity of this rotating equipment.

 fewer personnel required to operate small, compact gas turbine power plant.

G-E gas turbines climax more than 45 years of successful turbine building. Contact your G-E Apparatus Sales representative and discuss the applications of a combustion gas turbine in your plant. Or, write for technical article GER-754, "Where Industry Can Use the Gas Turbine," General Electric Co.,. Section 662-45, Schenectady 5, New York.



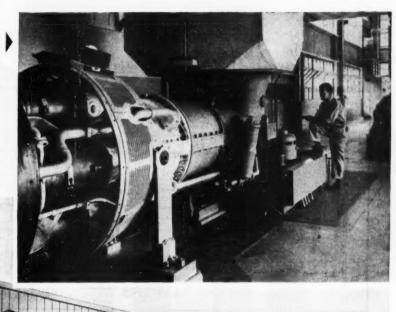
UP TO 120,000 LBS/HR process steam is available from the General Electric gas turbine power plant using a supplementary fired exhaust-heat-recovery boiler. Even without supplementary fuel firing, 40,000 lbs/hr is génerated.





OVER 30,000 HOURS OF ACTUAL OPERATION have been accumulated on this G-E combustion gas turbine since its installation at the Oklahoma Gas and Electric Company. Exhaust-heat-recovery system preheats boiler feed water for power plant use.

EFFICIENT AND ECONOMICAL gas turbine power plant generates 5000 kw of electric power at .8 power factor. Gas turbine is also well suited for mechanical-drive applications up to 6700 hp.



EXHAUST-HEAT-RECOVERY BOILER

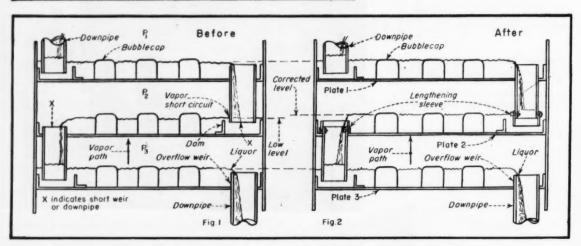
> SUPPLEMENTARY FIRING CHAMBER (OPTIONAL)

GENERATOR

AIR

GAS TURBINE

The Plant Notebook Edited by Theodore R. Olive



How to Modify Plate Columns for High Operating Rates

LEONARD STEBER, E. R. Squibb & Sons Div. of Mathieson Chemical Corp., New Brunswick, N. J.

★ December Contest Prize Winner

Plate type distillation columns are commonly designed with certain characteristics which tend to limit liquid feed and vapor rates to a certain anticipated maximum. Such limiting characteristics include tray spacing, overflow weir heights, and downpipe clearances above the trays.

However, operating schedules may require feed rates higher than originally planned. Or errors in construction may have reduced or increased the downpipe clearances called for in the design. In any event, increasing the feed rate may cause liquid build-up on the plates as a result of downpipe limitations, with consequent column flooding.

In such a case the liquid head and vapor friction drop from one plate to the next above it—e.g., P_1 and P_1 in Fig. 1—may be greater than the liquid head and vapor friction pressure drop through the downpipes between the trays involved. When this occurs the liquid flow through the downpipe from one tray to the next below may be reduced or stopped completely and thus cause increase in depth on trays above a point where the downpipe gap is too great (allowing vapor short-circuiting), or too small (re-

stricting flow). The pressure below the trays where the liquid build-up occurs will increase until the vapor pushes the liquor to the upper trays and into the vapor outlet line of the column, causing flooding of the condenser.

HOW TO CURE TROUBLE

One way to overcome the column defects described is shown in Fig. 2. Fig. 1 showed a short downpipe from Plate 1, and a short overflow weir on Plate 2. Fig. 2 shows both of these corrected by means of adjustable lengthening sleeves. The height of the overflow weir is thus increased to provide the necessary liquid seal for the downpipe from the next tray above—provided that the pressure drop through the plate is not greater than the liquid seal and vapor friction pressure drop in the downpipe to the next lower plate. The same method is shown applied to the short downpipe from Plate 1. Proper clearance of the adjustable sleeve prevents both short circuiting of the vapor up the downpipe, and restriction of the liquor flow by too close clearance.

A simple way to secure the adjustable sleeves is to slot each downpipe at diametrically opposed points to cover the required range of vertical movement. Two holes to fit the hold-down bolts are drilled in the extension sleeves, matching the downpipe slots. The sleeves are then anchored to the top or bottom of the downpipe by bolts provided with nuts and washers.

(Turn page)

★ January Contest Prize Winner

"Simple Venturi Nozzle Raises Efficiency of Pump Used for Mixing."

A prize of \$50 in cash will be awarded to Stanley Yokell, chief engineer of Process Engineering & Machine Co., Elizabeth, N. J. This fourth winning article by Mr. Yokell will appear in the April issue.

\$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of Chemical Engineering will award \$50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook. Each month's winner will be announced the second following month and published the third following month.

\$100 ANNUAL PRIZE—at the end of each year the monthly winners will be rejudged to determine the year's best Plant Notebook article, which will then be awarded an additional \$100 prize.

HOW TO ENTER CONTEST-Any reader of Chemical Engineering, other than

a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable materials must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible. Articles which are acceptable but are not winners will be published at regular space rates (\$10 minimum).

Articles may deal with plant or production "kinks," or novel means of presenting useful data, which will interest chemical engineers. Address Plant Notebook Editor, Chemical Engineering, 330 West 42nd St., New York 36, N. Y.

VALVE

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most difficult and unusual circumstances. Many of these units have been in service over 10 years and have never been taken "out of the line."

Truly an EXTRAORDINARY achievement of quality and design excellence.

INSTALL CASH STANDARD "TYPE 1000" VALVES

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A. W. CASH COMPANY-

DECATUR, ILLINOIS

In columns having segmental weirs and downpipes, a similar idea can be used to correct for improper weir height or pipe clearance. Slots are cut into the segmental weir or downpipe and metal strips drilled with matching holes are bolted to the weir—or to the bottom of the downpipe if needed. As above, this method can be used to provide the required liquid seal as well as the downpipe clearance needed to prevent either short-circuiting or restricted liquid handling capacity.

In columns with dams around the downpipes the liquid seal at the bottom of the downpipes can be varied in the same way, using sleeves or formed strips to secure the cor-

rect adjustment and insure stable operation.

This method of liquid seal adjustment permits increased flexibility of column operation where wide variations in feed rate and type are needed in a given column. It also permits correction of fabricating errors which do not follow specifications within down pipe design tolerances.

How to Improve Agitation of Heavy Pulp Suspensions

R. W. Moore, Metallurgist, Attleboro Refining Co., Attleboro, Mass.

In chemical engineering processes, as well as in extractive metallurgy, the aeration of heavy pulp suspensions is commonly carried out in a pachuca in which aeration and agitation are produced by the vigorous turbulence of a rising air column in a conical-bottom vessel. However, the agitation action



will be poor if the material in the tank is of high specific

gravity.

Much better agitation and aeration can be secured if, instead of a pachuca, a dish-bottom vessel is used, together with a propeller mixer rotating at 400 rpm. or better. In smaller vessels this can be a portable mixer, and in larger ones, a permanent propeller mixer discharging toward the dish bottom as shown. The air inlet is installed above the mixer and the propeller is rotated so as to direct the material and the air downward. The air in passing through the propeller is dispersed through the suspension in very fine bubbles. This, combined with proper positioning of the mixer, gives extremely efficient aeration and agitation.

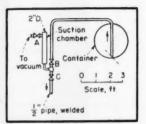
Sparks From "Sparkless" Metals

A recent issue of the Armstrong Trap Magazine points out that the so-called non-sparking metals may strike sparks under certain conditions. In one case a cast iron trap painted with aluminum paint gave off sparks when struck by a beryllium bronze hammer to release a struck float. It appears that the blow chipped off particles of paint and that the heat of the impact was enough to ignite the particles. It had already been shown in the literature that rusty iron coated with aluminum paint might produce a thermite reaction when struck with mild steel, brass or aluminum.

Safety Siphon is Portable, Starts Automatically

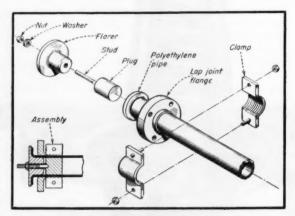
WILLIAM BABBITT, Foreman, Interchemical Corp., Textile Colors Div., Hawthorne, N. J.

Sketched here is a simple portable siphon which is useful for transferring corrosive liquids from one container to another, or from a container to a process system. It is never necessary for the operator to come in contact with the material handled, nor can



acid fumes be drawn into the vacuum pump used to start the siphon. Discharge is always under control of valve C.

The siphon is fabricated by welding from stainless steel pipe. At the side is a small vacuum chamber which, in the interests of mobility, is provided with a length of $\frac{1}{4}$ in. heavy duty hose for connecting to the plant vacuum system. In use the hose is connected to the vacuum line, Valve A is opened, with Valves B and C closed, leaving the chamber evacuated. Then A is closed and B is opened, allowing the chamber to fill with the liquid to be transferred. Finally, C is opened and the siphon is in operation.



Simple Tool Makes Lap Joints In Polyethylene Pipe

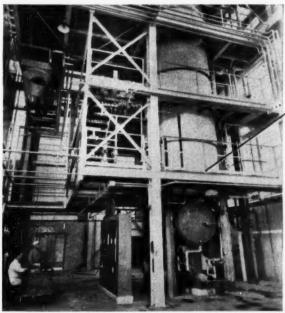
FLAVE PLEDGER and D. J. RYAN, E. I. du Pont de Nemours & Co., Sabine River Works, Orange, Tex.

A simple, effective method of forming integral lap joint flanges on polyethylene pipe has been developed by Du Pont engineers. Use of this method results in tight joints and simplifies connecting the plastic pipe to tanks and the

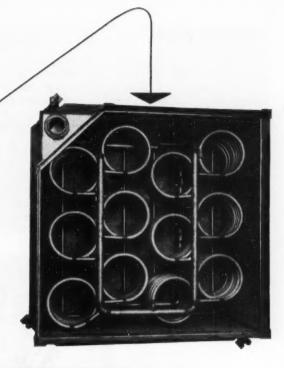
flanged ends of metallic pipe.

Polyethylene may be machined and welded much like metal. It has been common, therefore, to use threaded fittings and welded flanges for joints in polyethylene pipe. Because of its plastic properties, this pipe has been joined to metallic materials by banding, a method used successfully with rubber hose. All of these types of joints are satisfactory for ordinary service.

At times, however, the above methods are impractical



A 7.500 pound per bour Votator Semi-Continuous Deodorizer installed at Bayonne, N. J. This is designated a semi-continuous deodorizer because the oil is processed in small, individual batches. Deodorizer proper consists of tall, cylindrical carbon steel shell, inside of which are supported five superimposed trays made of stainless steel. Cooling or heating coils are also stainless steel.



We put the Bendability into Stainless Steel Tubing and Pipe

Here's tubing that's easy to coil because it's uniformly ductile, easily workable. And it's one of the big reasons you'll find it in equipment manufactured by the Votator Division of The Girdler Company.

ELECTRUNITE Stainless steel tubing and pipe have other advantages for the manufacturer. Wall thickness is uniform, and that's important. So are uniform diameter, uniform concentricity and uniform strength. And ELECTRUNITE Tubing meets many ASTM specifications, including A-214 for Carbon and A-269 in stainless analyses. It's also made to meet many customer specifications.

ELECTRUNITE Heat Exchanger Tubes have no hidden defects, because this tubing is made from flat-rolled steel that's inspected on both sides before the tubing is formed. It's free from scale, scabs and slivers, has a fine surface that resists corrosion. No longitudinal thin spots, either.

Before you consider new equipment . . . or replacements . . . get all the facts about Electrunite Heat Exchanger Tubes, available in carbon or stainless analyses. Write for Booklet CEC-54.

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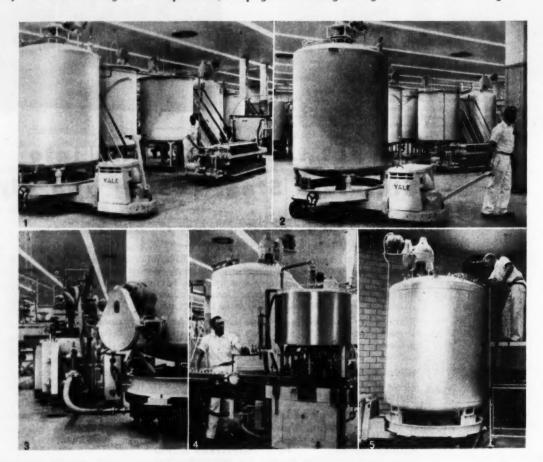
or inconvenient. In such cases, excellent connections may be made with lap joint (Van Stone) flanges. These are especially useful when joining polyethylene to tanks with flanged connections or to thin-wall stainless steel pipe which cannot be threaded.

To be used with lap joint flanges, polyethylene pipe must have an integral flange. Although polyethylene can be worked easily after immersion in boiling water, such flanges are difficult to form with conventional tools. A flaring tool, similar to those used for flaring copper tubing, has been developed which can form flanges on polyethylene pipe easily, quickly, and at low cost. The accompanying sketch shows the components and assembly of the tool.

Operation of the flaring tool is simple. First, the plug

is inserted in the tube and clamped. The end of the pipe is then submerged in boiling water which softens it. Next, the lap joint flange is slipped over the pipe, the flarer is placed on the stud and screwed into the pipe by means of a nut. Finally, the assembly is quenched in cold water and the tool removed. It is advisable to make up the joint as soon as possible after forming the ends, since polyethylene tends to resume its former shape after a period of time. An outstanding feature of this type of joint is that the flared polyethylene forms a natural gasket when the joint is tightened.

Where an exceptionally good joint is required for polyethylene pipe, lap joint flanges are the answer since they combine high strength and resistance to leakage.

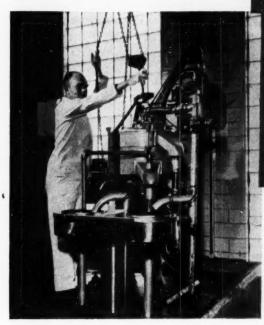


Move Tanks to Transport Product

Pharmaccutical plants must process and package many different liquids, some of which are extremely viscous. The problem of moving such products from the manufacturing to the packaging areas ordinarily means much pipe and a multi-story plant. The Upjohn Co., at its new single-story plant in Kalamazoo, adopted a totally different idea—glass-lined tanks on wheels which are filled from the processing tank, pulled by electric tractor to the packaging equipment, then are finally pulled to the cleaning area for hosing and scrubbing down in a matter of minutes.

In the sequence shown above Fig. 1 indicates how liquids from any of eight processing tanks are pumped through a filter into a 1,000-gal. mobile tank. In Fig. 2 the tank is being towed by the lift-truck-tractor to the next location, Fig. 3. Here the tank is coupled by a neoprene hose to the filling machine, Fig. 4. Finally, in Fig. 5, the tank reaches the cleaning station to be readied for the next use. Cleaning takes only a few minutes.

The 21 mobile tanks of 500 and 1,000 gal. size now in use are mounted on circular dollies designed by the company, for handling by a specially modified hand-steered power lift truck.





Centrifuges Used In Making Insulin

Insulin is made from the pancreas glands of cattle. It takes 1,500 animals to supply enough for just one ounce of Insulin. The process takes many months to complete and if it were not for centrifugal machines, would take a great deal more time.

To speed up the process of making Insulin, De Laval machines are used by leading pharmaceutical manufacturers in two phases of the manufacturing process: 1) separators are used to remove fat from the solution of Insulin and 2) clarifiers remove water-insoluble solids from the almost-completed Insulin. Thus, these pharmaceutical manufacturers are able to provide for diabetics the great wonder drug that restores their balance of sugar and starch.

Here is another example of how De Laval centrifugal machines speed up a process. The fact that centrifugal processing concerns a life-saving product, makes this application of greater than usual interest, but the basic fact remains: De Laval Separators and Clarifiers are the most effective means of making continuous liquid-liquid, liquid-solid and liquid-solid-liquid separations that industry affords.

DE LAVAL



THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

FOR FASTER PROCESSING SYSTEMS

You and Your Job Edited by Richard V. Reeves



Dr. J. S. A. Bois took a new science out of the clouds.



Put on a practical basis, it is helping men to . . .

Learn to Think Straight

Neatly tying together most of what we know about human behavior under the heading of General Semantics, social scientists have achieved amazing practical results.

Social scientists don't test new ideas with dramatic explosions the way the atomic scientists do. If they did, you might expect to hear an explosion which could rock the management world. The reason: a handful of men are talking about one of the really big advances in the control of human behavior.

The new discipline is called General Semantics and owes its existence to a late Alfred Korzybski. You can forget any notions you might have about "semantics" though. This new idea isn't just a lot of words about words. It cuts across boundaries of psychology, philosophy, psychiatry and the natural sciences—chemistry, biology, biochemistry, neurology, management and others.

ENGINEERING APPROACH

It is an entirely new approach to an understanding of the way we think, talk and act. It is partly what Bergen of Du Pont and others have called "an engineering approach to the problem of human emotions and emotional adjustments in industry."

General Semantics is not easy to understand without starting at the beginning. However, these are the main elements of what has been called "A new science of thinking." After generations of study and ex-

 Neurologists have told us all they now know about our brain and nervous system and the electrochemical reactions, etc. that take place when we "think" or respond to a stimulus.

• Psychologists have told us a great deal about the reasons certain people behave in a given way in a given situation at a given time.

 Philosophers and others have told us how we develop our knowledge about the world and the universe we live in and how we adapt to it.

• Natural scientists have told us about atoms, molecules, reactions and how we can manipulate and control these to fill our needs and desires.

• Semanticists have told us how we communicate with each other and with ourselves and how we can manipulate words and thought for better communication and understanding.

ASSEMBLING THE PIECES

From this vast storehouse of knowledge it remained only for someone to recognize and fit together all of the pieces of the puzzle, freely cutting across scientific boundaries, to come up with a method for understanding and controlling human behavior as much as it can be controlled.

Korzybski did this in his monumental book, Science and Sanity (1933).

Today, a few men are taking an active part in the extension of this work, men who, if not way ahead of their time, are at least ahead of their fellows. Among these is a unique consulting group called the Executive Methods Group. EM consists of three consulting firms which have joined forces.

Under the leadership of Dr. Bois, EM is taking an active part in the extension and practical application of Korzybski's fundamental ideas about the use of scientific methods and engineering principles to human relations and problem solving in industry.

First firm is Bois, McKay and Associates, Ltd. of Montreal whose head, Dr. J. S. A. Bois, an eminent Canadian industrial psychologist, is one of the world's foremost students of Korwheli

His associate, Jim McCay, is a management engineer with chemical engineering experience. The second firm is E. M. Gherman and Co., a Chicago management consulting organization, headed by Dr. E. M. Gherman, who has had extensive and successful experience in management methods and supervisory training.

The third member of this triumvirate is Management Development Associates of New York, management engineers specializing in executive development and headed up by Edward Walther and J. Collins Coffee, whose program has been described here (Chemical Engineering, Sept. 1953, pp. 284-98). MDA's staff includes inmore than 50 years of experience in designing and building dryers for industry...







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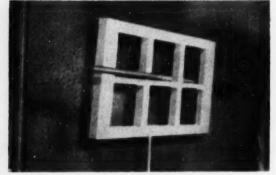
KNOW THE RESULTS BEFORE YOU BUY

Louisville engineers will test your dryer needs in our laboratory. When required, a pilot model will be checked in your plant before fullsize dryers are built.

Louisville's creative engineering pre-determines results for you!







THINGS AREN'T ALWAYS WHAT THEY APPEAR TO BE

Walther (white hair) and Coffee demonstrate an important prop which teaches reliance on thinking rather than sensory preception. Viewed from a critical distance, at eye-level, a rotating trapezoidal window will appear to be oscillating. And a rigid bar placed through it will appear to bend and go through the frame. Similarly, the G. S. trainers perform

other experiments designed to "disequilibrate the traince's self-assurance" by demonstrating that sensory preceptions are not always reliable. If you see a sour look on the boss's face in the morning, don't react too quickly. You may see a sourness which is not there. The "window" really turns when you see it oscillating.

dustrial psychologist, Dr. Robert P. Holston, president of the New York Society for General Semantics.

DOWN-TO-EARTH PROGRAM

Leaning heavily on the work of Bois and the participation of such Canadian clients of Bois, McCay and Associates as Trans Canada Airlines, Royal Typewriter Co., Ltd., and Canadian Ingersoll-Rand Co., Ltd., these men have readied a practical, down-to-earth program for executives that teaches them new methods of thinking, the elements of which can be learned readily and put to work in communicating, training, problem solving and human relations.

Management Development Associates has already incorporated G.S. material into its management training program at Hoffmann-LaRoche, Inc., and other clients such as the Link-Belt Co. and Post Cereals.

E. M. Gherman and Co. is now carrying on Executive Methods conferences for the Falk Co. and other Chicago area clients.

The most significant result is that the practice of G. S. methods gives everyone a better emotional control, both at work and outside. This ranges all the way from better health to less explosive behavior. From a general manager: "Even in the hot spots, I can, now, take a detached attitude from myself and my reactions most of the time."

Next comes the saving in time in daily administrative discussions and in committee work. It creates a general atmosphere of freedom to think aloud, of readiness to listen before jumping to conclusions. It gives the whole group a common set of mental tools and of communication devices that makes teamwork easier and quicker.

Problems are discovered earlier and solved with fewer personality clashes. It dispels the tragic urgency that

makes mountains of mole-hills.

Number and length of memos and letters are reduced.

Some report that they are now better able to evaluate quickly the many pages of technical and other literature they have to read.

It has trained them to distinguish more quickly and more easily between statements of facts and statements of conjecture. From a works manager: "I could give several examples of where I had gone off half-cocked before getting facts which would and did change my outlook or opinion. Actually I made the attempt to answer conjecture with conjecture, all of which was a waste of my time, even if I won the argument. I now realize that many queries are not framed properly and can only be answered by developing facts which first call for a revision of the initial question in order to permit a rational answer.'

Does it increase their capacity for "creative thinking?" It is hard to say. G. S.-trained men discard more promptly the plans that show a low degree of predictability, they evaluate more accurately the margin of chance that surrounds the decisions they have to make. They become flexible, de-

velop a healthy curiosity for new ideas, show constructive initiative.

CASE HISTORIES

As to specific case histories involving companies, here is what Bois says: "Those that come into evidence are so spectacular that they may sound like exaggerated claims on our part. Nevertheless, they are true."

"Here is one. The executive vicepresident of a firm where we have been applying G.S. for nearly three years told me the other day: "Two years ago we were \$300,000 in the red at the end of our financial year. This year we finished with \$3,000,000 profit. How much of this is due directly to Executive Methods, I can't say, but I am sure a large part of it can be traced back to what you have done in our firm.'

"Another. A shift of personnel had to be made at a high level, involving transfers, promotions, and 'non-promotions' that had been postponed because they were expected to bring about frustrations, tensions, perhaps clashes or resignations. A conservative estimate of the probable cost of cushioning the shocks ran into \$25,000 to \$30,000. The president was surprised to find that the interested parties, all G. S. trained, had already evaluated the situation, each one for himself, and had reached the same solution as he had. No friction, no trouble, no cost."

What Does G.S. Involve? See p. 246 ▶

Davison Bulletin .

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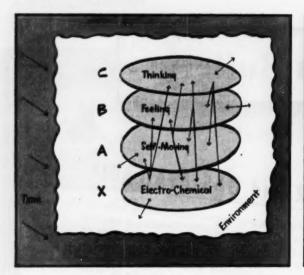
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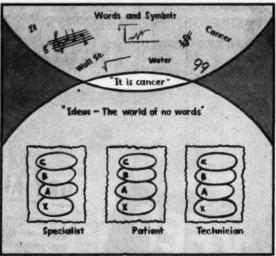
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What Does G. S. Involve?

By teaching you to emphasize thinking and minimize your emotional reactions, general semantics increases your effectiveness. You'll get more done and do it better.

Why does G. S. seem to be so much more effective than ordinary management methods.

While it would be impossible to describe G. S. training in this space, here is a brief description of two fundamental notions and diagrams developed by Dr. Bois: Semantic reactions and semantic self-regulation.

SEMANTIC REACTION

The term semantic reaction is intended to cover the overall response of an individual to any stimulus.

The cuts above explain this graphically. The four overlapping ellipses on the left, explain the many activities of man. Three of these ellipses, C, B, and A, cover activities that are within the range of common observation. The fourth, X, deals with activities that are revealed by scientific instruments and techniques.

In the top ellipse, C, we include all activities that emphasize thinking. Thinking includes ideas, language, symbols, writing, reading, talking, solving problems, planning, etc. A financial statement, a newspaper, a sales graph, a letter, etc. are things that man uses to think and to communicate his thoughts.

In the next lower ellipse, B, we in-

clude activities that go under feeling—pleasure, joy, anger, fear, desires, regrets, wishes, etc. Activities of this type reach lower on the evolution scale. They are more apparent in children than they are in mature adults

Ellipse A includes what we choose to call the self-moving activities. This covers the functioning of the organs and the movements of the body. The heart pumps, the lungs breathe, the whole body grows, etc.

Ellipse X covers the electro-chemical activities that have been discovered and measured by scientists. This is the field of electrocardiograms, electroencephalograms, of anaesthetics, of insulin, of vitamins, etc.

These various activities overlap and they interact: when something happens in one section, something happens in all others. When you think hard, you become tense; when you are emotionally upset your thinking goes awry; when you are given an anaesthetic, you stop thinking and feeling.

If our reaction to a stimulus takes place principally at the B level, it is an emotionally governed reaction. When a reaction is governed by the C level, it is considered to be controlled by the thinking processes.

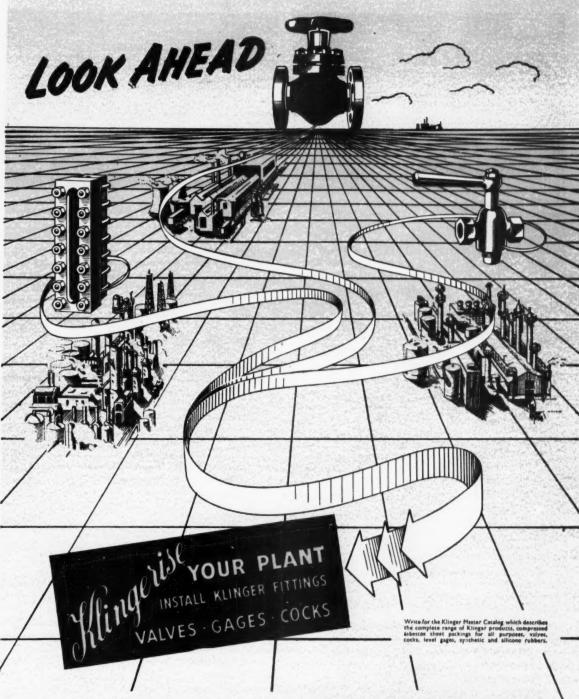
One further feature of semantic reaction is that the reactions of each individual are different from those of all other individuals.

This can be illustrated by a diagram (right). Let us represent three persons by as many diagrams as we describe above. The first, a physician, the second, his patient, the third, a research technician who keeps records in the hospital.

Above these diagrams we write a statement from the pathologist: "It is cancer." The words are clear enough. We can assume that all three persons agree as to the meaning. But do they react to it in the same manner? Evidently not. The event that the word described does not mean the same thing to all three. It is easy to realize that their semantic reactions are different at all levels of activity (C, B, A, and X).

The dictionary meaning of words and the semantic reaction to words are two entirely different things. The first belongs to "the world of words," the second belongs to "the world of nonwords." These two worlds overlap when a word is taken into the stream of life and acquires a unique meaning for the person who hears it or uses it at a particular moment under particular circumstances.

In a plant, how often do people react differently to simple key words such as "incentive," "grievance," "cost control," "planning," "system," etc.? You don't release tension by referring to the dictionary. Better learn to



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COURSES in general semantics are conducted by three management consulting firms. These form the Executive Methods Group.



COMPANIES at which the courses have been given include Link Belt, Canadian Ingersoll-Rand, Falk and Hoffmann-LaRoche.

evaluate semantic reactions and develop the skill of dealing with them.

When certain "habit patterns" develop, an individual becomes what Dr. Bois calls a "B-controlled" person—touchy, opinionated, childish, tense, casily angered, etc.; or a "C-controlled" person—stable, considerate, unselfish, soft-speaking, calm, a good listener. In other words we say that the C-controlled person is mature and poised and the B-controlled man is immature and childish.

HELP CHANGE YOURSELF

Most people are, of course, in between the two extremes. The important thing about Dr. Bois' work is that if you are willing to undertake the rigorous training and practice which learning General Semantics entails, you can change your behavior in the direction of "C" control.

After a man learns to recognize and control his B or emotional reactions and his C or thinking reactions, the EM trainers introduce another concept: semantic self-regulation. Expressed simply, this is a technique of feedback control by which an individual continuously analyzes what he is saying or writing while he is doing it. If he finds himself too far over on the emotional scale, he can compensate and swing back to the intellectual side. Similarly, an individual can recognize emotionally controlled behavior in the speech and writing of others and thus make adjustments for dealing with them.

Here is how Bois describes semantic self-regulation in terms of feedback control.

Feedback control systems have three purposes:

• Prevent the operating system from wearing itself out or from destroying itself by excessive bursts of energy:

• Keep it functioning within an optimum range of efficiency;

• Direct its energies toward a set objective that is consistently pursued under changing conditions.

The problem that faces us is to learn to control our semantic reactions, so that we can achieve the three purposes of any self-regulating system:
(a) save ourselves from excessive wear and tear, and eventual self-destruction;
(b) keep functioning within an optimum range of efficiency; and (c) remain oriented to a shifting objective. We must at the same time learn to apply a self-regulating control system to group work.

KNOW OTHERS BETTER

The most common indication that a man is out of balance in his individual or inter-personal behavior shows itself at the B-level: he lets his feelings and his emotions run away with him.

It is a well-known fact that emotionally charged ideas spread through a whole organization and tend to edge behavior off the track of maximum effectiveness. We cannot behave sensibly if we are angry, afraid, or overenthusiastic. In a group, an emotionally charged situation leads to the outcropping of defense mechanisms, politics, and personalities. If it is curbed by authoritarian methods, all members feel frustrated. The strong ones become hostile, the weak ones lose all initiative.

When an emotional disturbance spreads over the nervous system of an individual, he functions at his worst. If disturbances repeat themselves too often, the weak parts of the organism will give up eventually. This introduces the whole gamut of psychosomatic troubles from nervous breakdowns to peptic ulcers, high blood pressure, etc.

OTHER ELEMENTS

Semantic reactions and semantic self-regulation are only two of the key notions of G. S. Other basic elements relate to methods of fact-finding; methods by which conclusions are reached; ways of keeping preconceptions from distorting the understanding of new data; diagraming as a method of communication to show relationships more effectively than words; and the pitfalls of language, together with ways of overcoming them.

Effective use of language represents one of the most important areas in General Semantics. As MDA's Dr. Holston says, "Language is not, as most people think, simply a way of reproducing or voicing ideas, but is, itself, a shaper of ideas and of action.

"Problems of communication, poor analysis of problem situations and other difficulties which plague both engineers and executives can often be traced to built-in structural deficiencies in our language, of which we are largely unconscious.

"One of the jobs of G. S. training is to sensitize people to these difficulties and to help them to use language more effectively.

"The necessity for retaining language habits accounts for the fact the G. S. is difficult to learn, but at the same time, is immensely rewarding to those who have studied it seriously."



The EM group recognizes the possibility of a wide variety of applications for its approach, and expects to adjust to the needs and requirements of each situation.

One example is the approach MDA is taking at Hoffmann-LaRoche, Post Cereals and other companies. The executive training program covers the field of problem-solving, management planning and control tools, the efficient use of time, leadership, communication skills and human relations. Management engineering techniques are used to produce on-the-job results and G. S. methods form the thinking-feeling groundwork at the language level.

"Summing up our experience," says Ed Walther, "we have found G.S. methods to be increasingly valuable as a basic part of our total executive train-

ing program.

"The principal results in specific development situations relate to the amazing difference with which executives in our program respond. We can measure it in terms of enthusiasm, reduction of time to achieve results, and better results in such areas as skill in problem solving, personal adjustment, human relations and creativity.

"Another thing we have noticed is the applicability of G. S. methods to a wide range of situations and specialized areas. Incorporated into a 'tailor-made' approach to the development problems of specific companies and individuals, it has applications at every level in the organizational structure.

"Response of individuals has been excellent, considering the substantial changes required of the individual in his ways of looking at the world and at himself.

"There has been resistance, usually the more rigid thinkers, though sometimes from the bright and flexible men too. Most of the time, resistance turns to enthusiasm (usually greater in degrees than that achieved with those who didn't resist) as the increasing values of this basic management tool becomes more evident.

"In our judgment the search for ways in which executives can learn to keep up with the continued expansion of their responsibilities under today's conditions must inescapably include G. S. methods. Faster, better discussions, less pressure on the individual, and a better grasp of the funda-

mentals of executive thinking and action are direct results."

EXECUTIVE TRAINING

. . New Course

Carnegie Institute of Technology has announced that a "Program for Executives," a nine-week course, is being offered for mature executives to help them meet the broader and more complex requirements of senior-level positions in their organizations. The program will begin March 8, 1954 at the Graduate School of Industrial Administration, and will continue through May 7.

The course is designed for men from both large and small companies. Admission will be limited to a group of about thirty carefully selected executives in order to provide an opportunity for maximum personal participation and exchange of ideas.

The program will consist of four major work areas: Business Policies, Human and Labor Relations, Financial and Other Quantitative Controls, and Business in the American Economy. Throughout the program, informal discussion and conference procedures will be followed.

The course has been planned by Carnegie officials after extensive discussions with business leaders about the abilities required for future senior executives. The abilities most emphasized were: (1) capacity to take a company-wide view of operating problems; (2) understanding of the human problems of business organizations; (3) skill in organizing and analyzing facts for decision-making; and (4) understanding of broad economic and political problems.

UTILIZING ENGINEERS

. . . 12 Steps

The National Manpower Council recently outlined the following steps to improve utilization of engineers:

1. The first step must be to make more effective utilization the focus of genuine and continuing attention at all levels of an enterprise.

If improved utilization begins at any one point, that point is improved training, not only in the colleges and on the job, but also in the elementary and secondary schools. 3. Much more has to be learned about the jobs which engineers and related supporting personnel are doing in order to reassign duties among different kinds of technical personnel.

4. Engineers have to have the best tools and instruments, as well as good supporting personnel, if they are to make efficient use of their training and

talents.

5. Improved utilization requires effective communication from management to engineering and related personnel about the objectives of their work. Moreover, since the actual changes in utilization take place well below the level of top management, effective communication upward is also essential.

6. Changes in the organization of enterprises can open up new possibilities for the better utilization of personnel. Too much organization may prevent necessary freedom in the allocation of effort, while too little organization may result in duplication, lack of proper priority, and unwise allociation of personnel to projects.

7. Improved utilization can also be achieved by keeping technologically trained people at the technological jobs for which they are best fitted through incentives in the form of status, recognition, and money rewards which are generally associated with jobs in management and sales.

8. Utilization can be improved through recognition of the fact that an individual's effectiveness and interest on the job is affected by many things outside of his work.

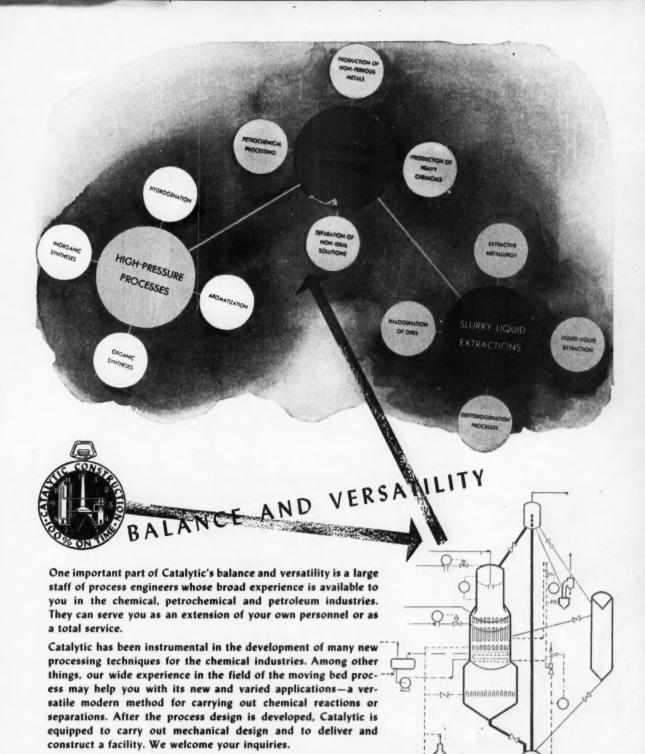
 Attempts to improve utilization must always take into account normal human resistance to changes in the

setup which people know.

10. Utilization can be improved by management, not only by calling upon the manifest capacities of engineering personnel, but also by making an effort to develop their potential capacities through imaginative assignment and training.

11. Efforts to improve utilization must distinguish among what can be accomplished to secure immediate gains, what may yield results only after some investment of time and money, and what changes are fundamental and long range in character.

12. Improved utilization is achieved not through any single device, but by the use of many related measures.



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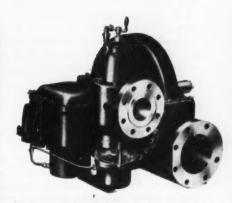
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The Corrosion Forum Edited by Morgan M. Hoover

CHLORIMET 3 Nominal Composition **Properties** Nickel 60.00% Tensile strength, Chromium 18.00% .75,000 psi. Yield, psi 50,000 Elongation, % in 2" . . 10 Hardness, Brinell . . . 220 Wt., lb. per cu. in . . 0.325 Molybdenum ... 18.00% Iron, max. 3.00% Silicon 1.00% Carbon, max. . . 0.07%

Chlorimet 3

The corrosion resistance of this important material of construction to a number of corrosives, with physical properties and applications in the chemical industry.

WALTER A. LUCE The Duriron Co., Dayton, Ohio

Chlorimet 3 is another high alloy material combining high strength and excellent corrosion resistance under severe conditions. Like the nickelmolybdenum alloy, Chlorimet 2, described in last month's Corrosion Forum, Chlorimet 3 provides resistance to special media not approached by other types of commercially available metals and alloys. It retains much of the excellent resistance to reducing corrosives that characterizes the nickelmolybdenum types. In addition, its high chromium content provides good resistance to many severe oxidizing

Close examination of composition of Chlorimet 3 shows that it contains approximately four parts nickel to every part of molybdenum and chromium. Other elements which serve no useful purpose, and may even be deleterious, are kept to a practicable minimum. Iron is such a contaminant and is rigidly maintained at a 3 percent maximum. Tungsten has also been found to increase the pitting tendency of this type alloy in critical media and is maintained at a negligible level. The deleterious effect of tungsten and carbon on the resistance to pitting is illustrated by Fig. 1. Because of the normal tendency for carbon to affect the corrosion-resistant

properties of chromium-bearing alloys, this element is maintained at a very

Chlorimet 3 is produced in the cast form only. Although it is primarily fabricated into such items as pumps and valves, it is also widely applied as special castings. From Fig. I it will be noted that an alloy of the Chlorimet 3 type has maximum resistance when water-quenched subsequent to uniformly heating to 2,050 deg. F. Prior to shipment all Chlorimet 3 castings are given this treatment. Higher heat-treat temperatures are of no benefit when the chemical composition is controlled within the limits given in the table above.

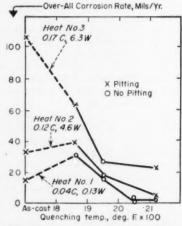
The Chlorimet 3 alloy is extremely tough and has only fair machinability when compared to carbon steel. However, with proper technique and equipment it can be readily handled. It is necessary to have a rigid set-up that will minimize chattering. Carbidegrade cutting tools produce best results particularly when used with proper equipment. Since Chlorimet 3 work-hardens readily, a relatively deep feed and a slow surface speed will provide best machinability. If the surface is allowed to work-harden because of insufficient feed, the machining operation becomes extremely

difficult. Detailed instructions can be supplied upon request. Chlorimet 3 can be readily welded. The metallic arc method is usually preferred, although other common welding methods have been successfully used. To assure maximum corrosion resistance the welding operation should be followed by water-quenching from 2,050 deg. F.

As mentioned previously, Chlorimet 3 is applied mainly for severe services which prove destructive to other lessexpensive alloys. It is inherently resistant to a variety of corrosives both oxidizing and reducing, and because it does not depend on the formation of a passive film for its resistance, it can be used for the alternate handling of different media with good results. For instance, numerous plants apply this alloy as a pump to alternately handle the following corrosives: strong hydrochloric acid, strong nitric acid, sulfuric acid, hydrofluoric acid, chromic acid, and caustic. One or more of these corrosives would eliminate other commercial alloy types from consideration. This illustrates the versatility of this alloy for corrosive applications.

Another primary application of Chlorimet 3 equipment involves the strong reducing acids which unavoidably have oxidizing tendencies. Although normally inferior to Chlorimet

(Continued on page 260)



Corrosion rate of nickel-base 18% Mo-18% Cr alloy versus quenching temperature and percent carbon and tungsten. (Aerated, 5% HCl plus 0.5% HNO₅ at 158 deg. F.)



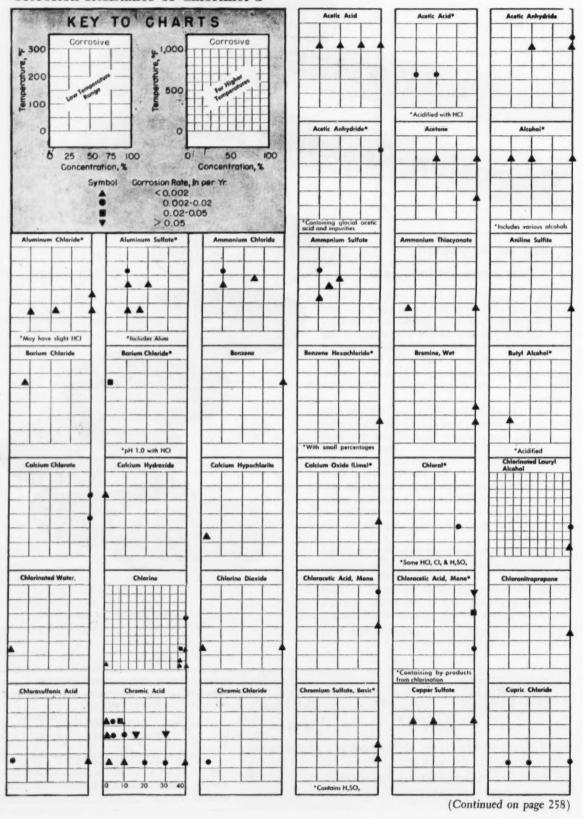
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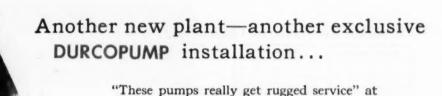
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Corrosion Resistance of Chlorimet 3





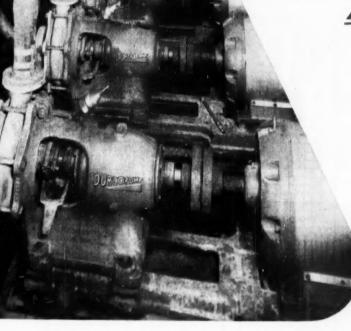
ELECTRO MANGANESE CORPORATION

ZMNZ

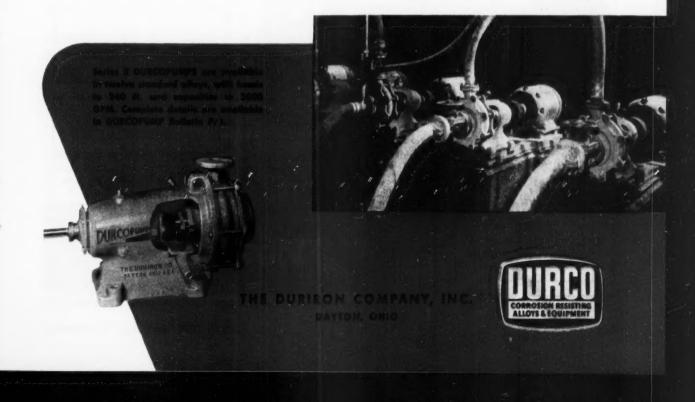
KNOXVILLE, TENNESSEE

For dependable pump service under tough operating conditions, Electro Manganese Corp. went to DURCO exclusively in their new plant in Knoxville, Tenn. All of the process pumps in this plant are DURCO-PUMPS. These handle various corrosive solutions including sulfuric acid, cell liquors made up of sulfuric acid and manganese sulfate, muds from settling and filtering operations, and abrasive waste slurries.

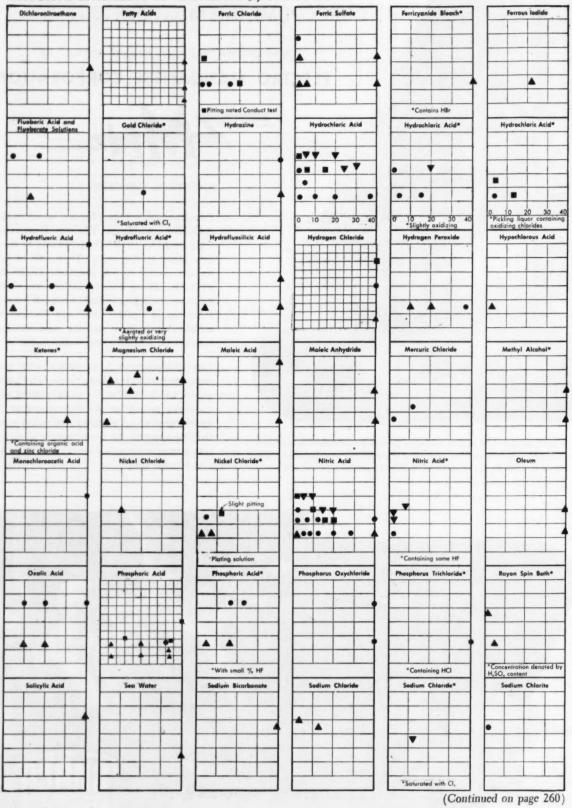
Electro Manganese Corporation is the sole domestic producer of pure electrolytic manganese (99.9 \pm %) for the metallurgical and chemical industries. Electromanganese is widely used as an alloying and sulfur controlling agent in the manufacture of stainless and special alloy steels and various non-ferrous alloys.



A bank of Durimet 20 Durcopumps handling manganese sulfate solution with 3% tree sulfuric acid, a portion of the new Knoxville plant enabling Electro Manganese to double its production capacity.



Corrosion Resistance of Chlorimet 3, cont. . . .



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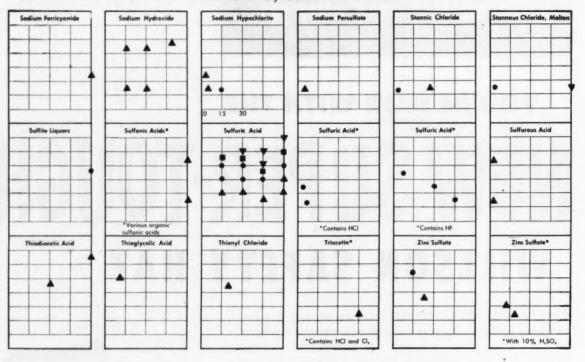
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Corrosion Resistance of Chlorimet 3, cont. . . .



(Continued from page 254)

2 for commercial muriatic acid at normal temperatures, there are occasions where the presence of ferric, cupric, or similarly oxidizing ions will render the chromium-free alloy unsuitable. Under such conditions Chlorimet 3 has often given excellent service providing it has a satisfactory degree of corrosion resistance to the basic corrosive. A routine corrosion test in the field will provide this basic data if it is not available. A similar situation also occurs in the manufacture of television tubes where hydrofluoric acid solutions are used for etching purposes. Although Monel is normally used with this acid, it proved to be unsatisfactory in this case because the acid became highly aerated in the spraying process. Chlorimet 3 provided excellent results and is now widely used.

The accompanying corrosion charts will show that Chlorimet 3 does not have the same wide applicability of such chrome-free alloys as Chlorimet 2 or Monel to severe reducing acids—nor does it possess the same excellent resistance to nitric acid as the austenitic stainless steels. But it does possess

a combined resistance to both type media not approached by these other type alloys. Chlorimet 3 has a good resistance to many severe chloride services which have strong pitting tendencies. It is being widely applied for various bleach solutions including sodium hypochlorite, wet chlorine, and sodium chlorite. In chlorination operations where small percentages of chlorine, hydrochloric acid, and water are often encountered simultaneously, Chlorimet 3 equipment is widely used. It has also been applied for certain ferric chloride solutions which are known to be extremely destructive. These are typical of those services for which Chlorimet 3 is commercially economical.

Chlorimet 3 is widely used in many diversified industries such as alcohol manufacturing, chlorinated products including solvents, dyestuffs and bleaches, food products, glass manufacturing, heavy chemicals, insecticides and other agricultural chemicals, municipal sewage and water treatment, petroleum refining, pharmaceuticals, pigments, plastics, pulp and paper, steel processing, soaps and detergents, production of synthetic fibers and electronic tube manufacturing.

The corrosion data cited in the accompanying tables are a combination of plant and laboratory results obtained to date. These charts include most of the severe chemicals for which it is presently finding application and they also include data illustrating those services for which it cannot be applied. Many organic chemicals are included in these charts. Chlorimet 3 would not normally be an economical selection for these chemicals but in many instances destructive contaminants are present which make them difficult to handle. Destructive chemicals may also be alternately handled with these organ-

No effort has been made to include those organic and inorganic materials for which Chlorimet 3 would be resistant but has not as yet been applied.

Since plant data are included in these charts, it should be pointed out that it is difficult to accurately transpose an actual service life into an exact corrosion rate. In the absence of prior corrosion data, good service life of many years' duration is usually rated in the 0.002 to 0.020 ipy. category.



generator, and on lines serving strip heaters in power house.

Everdur passes long test on Duluth-Superior span

One job Everdur* Electrical Conduit does on the Duluth-Superior Bridge is protect electric light lines. Heavy rain and snow driven by 60 to 70 mile-an-hour winds often pound at this conduit. Heat and cold do their worst. It is exposed to acid fumes from ore boats and rail traffic. Vibration from opening and closing of the bridge, and constant traffic, is a daily threat. Yet recent inspection shows the Everdur Rigid Conduit

still in excellent condition. Not a sign of wear, rust or corrosion!

Everdur Electrical Conduit is made of Everdur Copper-Silicon Alloy in two wall thicknesses (R.C. and E.M.T.). For additional information about this Anaconda Product, write to: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

wherever corrosion resistance counts — EVERDUR ELECTRICAL CONDUIT

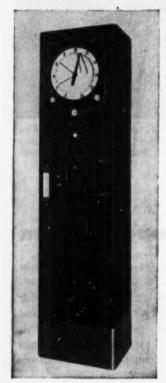
an ANACONDA product



infra-red analysis tells how much of a selected component exists in gas mixtures. Here, continuous analysis recorded by an Electronik potentiometer on a refinery's graphic panel is used for actual process control.



mass spectrometry separates materials on the basis of their different molecular weights . . . finds what constituents are present in what quantity. Above is a "package" mass spectrometer in which an ElectroniK instrument records test data.



gas analyzer, operating on the thermal conductivity principle, combines an Electronik recorder, analysis cell and accessories in a single panel assembly.

New concepts utilize

These are some of the manufacturers who use ElectroniK instruments in their analyzers

Products of the companies checked are illustrated on these pages

Applied Research Laboratories

Baird Associates

Bausch and Lomb

Beckman Instruments, Inc.

Consolidated Engineering Corporation

√ Davis Emergency Equipment Co.

√ General Electric Co.

Jarell-Ash

Mine Safety Appliances Co.

North American Philips Co., Inc.

Perkin-Elmer Corp.

√ Podbielniak, Inc.

Precision Scientific Co.

E. H. Sargent & Co.

Tracer Laboratories

√ Applied Physics Corp.



of process control Electronik instruments

From the analytical laboratory comes a new concept of industrial process control, based directly on the desired chemical or physical characteristics of the product.

Continuous analyzers now make it possible to measure composition of gases and liquids accurately and automatically . . . to record this information . . . even to actuate automatic controls. Instead of temperature, pressure and flow, these new systems deal in terms of refractive index, density, ultraviolet and infrared spectra, radiation intensity and absorption.

An essential component of all these systems is automatic recording. To fill this critical function, leading manufacturers of automatic analyzers choose *ElectroniK* instruments. They choose them

for their exceptional accuracy, that exploits fully the inherent precision of the new measuring techniques. They choose them, too, for sensitivity that records every essential change in readily readable detail. And they prefer *ElectroniK* recorders for their simple, rugged design that guarantees dependable service under any industrial conditions.

Your local Honeywell engineering representative will be glad to discuss the role of *ElectroniK* instruments in product-analysis systems . . . or in any conventional process control. Call him today . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR Co., Industrial Division, 4478 Wayne Ave., Philadelphia 44. Pa.

■ REFERENCE DATA: Write for Bulletin 15-14, "Instruments Accelerate Research."



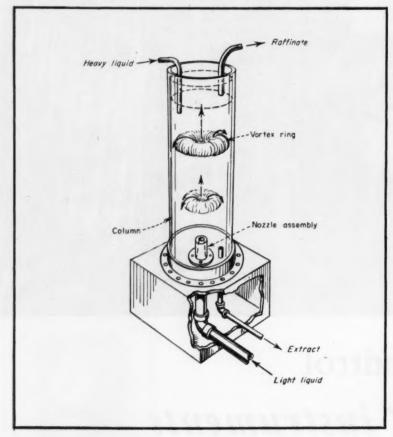
Honeywell

ROWN INSTRUMENTS

First in Controls

Tomorrow's Technology Melvin Nord, Chemical Engineer & Patent Attorney, Detroit, Mich.

NEW EQUIPMENT PATENTS



"Smoke Rings" Up Extraction

Projecting one liquid through another in form of vortex rings boosts efficiency in liquid-liquid extraction. New method is almost independent of density difference.

Surely you've watched smoke rings move through the air. Perhaps you've noted the turbulence, the helterskelter motion of the smoke particles, and maybe you've even contrasted this with the stability of the ring itself. Then as the ring moved further and further away, you promptly forgot all about it.

Think back to that smoke ring now and see how the principle has been used to increase the efficiency of liquidliquid extraction operations.

► Vortex Rings—That smoke ring was an example of a vortex ring in the

gas phase. A new, and novel, extraction method has been described for projecting one liquid through another in this form—rings of toroid or doughnut shape.

These rings have several advantages over the drop method of passing one liquid through another. That high internal turbulence found in the smoke ring is one. Such turbulent motion within the ring aids the diffusion operation by decreasing the thickness of the interface between the ring liquid and the other phase. And it does this without promoting emulsion difficul-

ties. Without emulsions, separation of the liquid phases is easier, and there is no need for additional coalescing equipment.



▶ Ring Stability—Stability is another desirable characteristic of the ring. As an example of this stability, the inventors of the new technique have successfully projected colored water rings through a column of uncolored water.

Such high stability makes this method virtually independent of the density difference between the two liquids. With liquids of almost the same density it is only necessary to increase the velocity at which the ring is projected.

An example of this is cited in the patent. Alcohol was extracted from aniline by water. The "impure" aniline, slightly lighter than the water, was formed into rings. Water was the continuous phase.

As the rings rose, and the alcohol diffused into the water, the density difference reversed—aniline becoming heavier than the water. Nevertheless, the doughnut-shaped rings continued up the column under their original momentum.

▶ Equipment—An experimental type of vortex-ring extraction apparatus is shown. Essentially it consists of a glass column, 9 in. in diameter, mounted in a lead collar atop a brass plate. The nozzle-holding assembly is sealed liquid-tight to the plate and connected to the inlet pipe.



The nozzle is 2 in. long with an internal base diameter of 1.6 in. Di-

Cuteway drawing shows how J-M Weather-Protected Insulation is applied to canks such as those at the S. D. Warren Company paper mill. Standard methods for mechanical securement of the insulation are used. Asbestocite sheets are then applied over the insulation, in accordance with the simplified Johns-Manville specification.

A (Above) Completed job of J-M Weather-Protected Insulation on black liquor tanks of the S. D. Warren Company.

(Right) Skilled applicators of an outstanding J-M Insulation be Contractor, P. S. Thorsen Co. of South Boston, Mass., applying Abestsocite sheets over Zerolite insulation.

S. D. Warren Company saves fuel, reduces maintenance on outdoor tanks with J-M <u>Weather-Protected</u> Insulation

On black liquor tanks of the S. D. Warren Company paper mill at Cumberland Mills, Maine, Johns-Manville Weather-Protected Insulation pays a "double dividend":

It saves money on fuel and maintenance. J-M Zerolite* insulation keeps the heat in... thereby saving a substantial amount in fuel costs. J-M Asbestocite*, a strong asbestos-cement sheet material, covers the Zerolite Insulation to protect it both from the weather and from wetting due to normal plant operations. This "bodyguard" layer of Asbestocite Weather Protection makes the tanks virtually maintenance-free and helps hold down operating costs.

It helps provide close temperature control. The temperature of black liquor in these tanks must be maintained so that it will flow freely and not clog up pumping apparatus. J-M Weather-Protected Insulation helps do the job dependably and economically.

Whatever the operating temperature of outdoor tanks and vessels, Johns-Manville offers the right insulation for application under the Asbestocite weather protection. For example, J-M 85% Magnesia Insulation is also widely used for this service because of its proved performance for temperatures to 600 F.

To be sure that the insulation and its weather protection is properly applied to pay the greatest return on your investment, J-M offers the services of experienced J-M Insulation Engineers and J-M Insulation Contractors. These men stand ready to give you an insulation job that will more than pay off your initial investment through maximum fuel savings.

For further information about J-M Weather-Protected Insulation, write to Johns-Manville, Box 60, New York 16, New York. In Canada, 199 Bay Street, Toronto 1, Ontario.

*Reg. U.S. Pat. Off.

Johns-Manville FIRST IN INSULATION

MATERIALS . ENGINEERING . APPLICATION

ameter at the top is 0.5 in. The converging walls form an included angle of about 30 deg.

Rings are launched through the nozzle by a piston-type pump on the light liquid feed line. Light liquid enters through the nozzle and is projected up the column in the ring form. Raffinate overflows at the top. Heavy liquid, introduced at the top, is drawn off the bottom as extract.

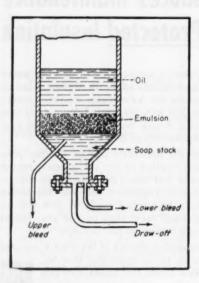
▶ Better Efficiency—The apparatus was operated using acetic acid dissolved in benzene as the ring phase and water as the continuous phase. For comparison, a spray tower was also operated on the same system, using acetic acid-benzene drops formed by half-inch nozzles.

With the concentrations expressed as lb. moles of acetic acid per cu. ft. of benzene, here are the results of a typical run:

	Rings	Drope
Feed concentration	0.00602	0.00602
Raffinate concentration	0.00224	0.00368
Percent extraction	62.9	38.9
H. T. U., ft	1.04	2.03

In all cases, results obtained with vortex rings were considerably better than those obtained with drops.

The novel technique was developed by William R. Works and Frank A. M. Buck and is described in their patent, U. S. 2,659,664.



Use of Bleed Tubes Controls Oil Draw-Off

During the refining of fatty oils, such as cottonseed or soybean oil, the material is run into a vertical tank and

reagents, such as caustic soda and water, are fed into the top. The mixture is agitated for a while and allowed to settle.

The heavier, aqueous soap stock falls to the tank bottom, and the refined oil rises to the top. Between the two materials an emulsion layer forms. Refined oil is recovered by drawing off the two bottom layers.

► Control Essential—Good control of the draw-off operation is necessary. Leaving some of the emulsion behind reduces the quality of the refined oil. On the other hand, if the emulsion layer is removed completely and some oil is taken with it, the yield of refined oil is reduced.

To get more accurate control, bleed tubes are proposed. One extends into the conical bottom of the tank, the other is placed at the very bottom. When the tank's contents are discharging through the draw-off line, valves in both bleed lines are opened.

As the emulsified layer reaches the upper bleed tube, the operator can spot the emulsion entering the conical section. He is then ready to stop the draw-off flow as soon as refined oil begins to discharge from the lower bleed tube.

This simple, yet effective, innovation is described in U. S. 2,661,093 by Alton L. Sawyer.

Turbulent Flow Dryer Boosts Drying Rates

A novel dryer, designed specifically for drying wet strip materials, has recently been revealed.

By confining the surface of the wet material within passages of small cross section, the new device increases turbulence in the drying medium. Results: higher drying rate per unit area with low volumetric flow rate.

The new dryer overcomes the difficulties encountered in conventional practice. Usual methods of upping the drying rate are two:

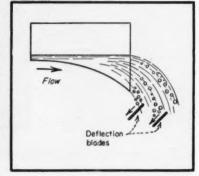
• Raise the temperature. This is not practical when drying heat-sensitive materials:

• Use more air. This boosts equipment size and power costs.

Increasing turbulence in the airstream makes diffusion easier, by decreasing the thickness of the stagnant film between the wet material and the flowing air.

The inventor, Leonhard Katz, de-

scribes the apparatus in U. S. 2,659,-162, assigned to Raytheon Manufacturing Co.



New Classifier Spout For Ouick Separations

Here's an improved spout construction for the laminar separation of solids in a fluid stream.

As shown, the new spout ends in a downward curve, designed to drop the velocity and minimize turbulence in the discharging fluid. That's why you can expect to find even the smallest particles of the heavy solids remaining in the lower portion of the exit stream.

Deflector blades, placed at varying distances from the end of the spout, scparate the layers of solids into groups of different densities.

It is claimed that the new design makes possible a quick, accurate separation of solids of similar specific gravities, e.g., 1.25 to 1.6 for commercial coal. The spout is described in U. S. 2,660,305 by Jean A. Labouygues.

For Keeping Posted . . .

This department is designed to keep you up-to-date on what's new and novel in American equipment and processing. It is a digest of recently issued patents, selected and evaluated for you by Dr. Melvin Nord, Chemical Engineer and Patent Attorney, 664 Putnam, Detroit 1, Mich.

You can get copies of any patents, including those mentioned in these columns, by ordering by number from the Commissioner of Patents, Washington 25, D. C. They cost 25¢ each. Do not send stamps.

ON INFRARED FOR THE PROCESS PLANT THE ONLY COMPLETE RANGE OF INFRARED INSTRUMENTS TO MEET ALL REQUIREMENTS

How to protect Catalyst from CO "Poisoning" in Ammonia Synthesis

Catalyst poisoning due to excess CO in the feed gas is a serious problem in an ammonia synthesis plant. Plugging troubles arising from carbamate formation due to CO₂ is another headache to the process engineer. Continuous analysis of the process stream by infrared analyzers can forestall such problems and check on scrubbing efficiency. Since the catalyst cost for recharging a typical reactor is \$20,000, the instruments will often pay for themselves in the first few weeks of operation.

Infrared analysis is the only method that permits the continuous analysis of CO or CO₂ at the low concentrations involved in plugging or poisoning, And Perkin-Elmer TRI-NON* Analyzers are the only analyzers with sufficient sensitivity and stability to meet plant requirements for accuracy and long term reliability.

TRI-NON Analyzer specifications for these infrared analyzers are as follows:

CO₂: 0-25 ppm full scale at 100 psi, readability $\pm 1\%$, absolute accuracy for 24-hour period $\pm 2\%$.

CO: 0-50 ppm full scale at 100 psi, readability $\pm 1\%$, absolute accuracy for 24-hour period $\pm 2\%$.

Write us for further information concerning continuous low level analysis of CO, CO₂ and other components. Our Engineering Applications Staff will be pleased to supply you with complete information including installed costs and performance guarantees.

FOR THE PILOT PLANT—Model 14 Multi-Component Analyzer—Continuously records the concentration of up to six components in a pilot process stream on a six-minute cycle. Ideal for tracking the effects of temperature, pressure, efc., changes in a pilot stream.



FOR THE PROCESS PLANT—Model 93 BICHROMATOR* Analyzer—For continuous control of liquid or gas streams. Records the ratio of any two wavelengths chosen. Thermostatted; enclosed in explosion-proof containers.



FOR THE PROCESS PLANT—Model 103 TRI-NON® Analyzer—Highly stable and sensitive. Suitable where there is considerable interference from stream components. Thermostated, enclosed in explosion-proof containers.

*Trademark The Perkin-Elmer Corporation

The Perkin-Elmer Corporation, 830 Main Avenue, Norwalk, Conn. Regional Offices: New Orleans, Louisiana and Chicago, Illinois

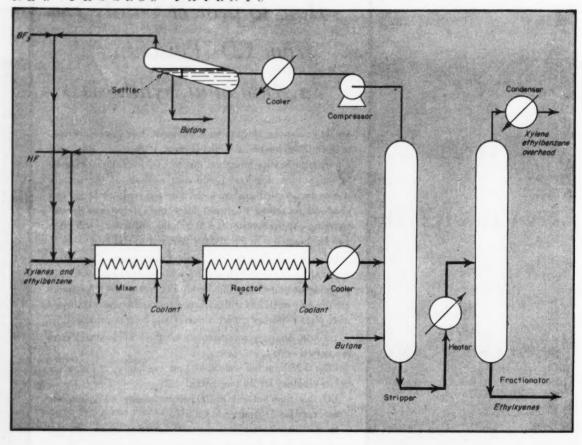
WORLD'S LEADING MANUFACTURER OF ANALYTICAL INFRARED EQUIPMENT

PERKIN ELMER

Models 93 and 105

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ADDRESS



New Process Yields Heat-Stable Plasticizer

Here's a process for the production of 1,3,5-ethylxylene, a plasticizer with a higher-than-ordinary softening point. Gives promise of improved polystyrene resins.

One way to get around temperature limitations on the use of plastics is to find a better plasticizer—one with a high softening point.

Heretofore, the use of polydimethylstyrene resins had been limited by a low softening point—only 212 deg. F. This low softening point has been attributed to the presence of dehydrogenated o-ethylxylenes in the plasticizer—usually a mixture of ortho and meta ethylxylenes.

A new revealed process uses a modified Friedel-Crafts reaction to make high-grade 1,3,5,-ethylxylene. This could be the looked-for high melting plasticizer. Using it for resin production would minimize formation of the

low-melting intermediate usually encountered.

▶ The New Process—The charge consists of a mixture of o-xylene free, mand p-xylenes and ethylbenzene (on the order of 61, 24 and 15 percent respectively). If the feed contains a high percentage of ethylbenzene, the ratio of xylene to ethylbenzene can be increased by xylene addition.

Liquid HF and BF_a catalyst are mixed with the feed. Their ratio is critical if a single phase system is to be obtained. Volume percent of HF may vary from 20 to 600; for a typical run, 150 volume percent (based on the xylene charge) might be used. And about 0.75 moles (per mole of xylene)

of BF₃, added to insure complete solution of all free xylene and ethylbenzene in HF.

► Temperature Control—The HF, BF_s, xylene reaction is exothermic. Therefore, the mixer is equipped with cooling coils for accurate temperature control.

After cooling, the mixture flows to a carbon steel autoclave operating at 140 deg. F. After one hour, the reaction and the isomerization of ethylxylenes into the desired 1,3,5, configuration is completed.

The single phase system is quickly cooled to minimize the breakdown of xylene—which occurs at high temperatures. Next, it proceeds to a stripper where HF and BF_a are removed from the hydrocarbons under vacuum. A stripping agent, such as butane, is added to hasten fluoride removal.

Passing to the condenser, butane

Which of these 22 tube steels will give you maximum tube life per dollar? Ask the experts!

This month's report is on:

2% CR.-MO.

Has intermediate corrosion resistance in combination with good creep strength and fair resistance to oxidation. For use at temperatures up to 1200° F. in cracking coils, reforming units, heat exchangers, vapor line and hot oil piping, and return-bend forgings for oil heaters.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

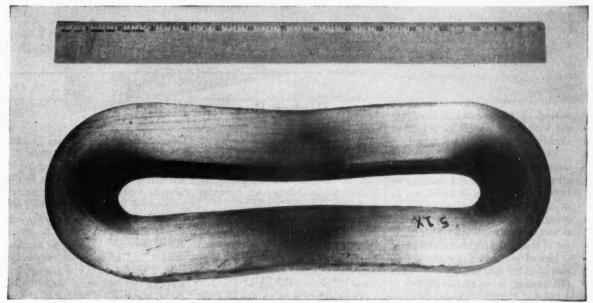
Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 21/4	Sicromo 5MS	16-13-3
DM-2	21/1% Cr1% Mo.	Sicromo 7	25-20°
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% CrMo.	18-8 Stainless	35-15**
2% CrMo.	4-6% CrMoTi.	18-8 Cb	16-25-6**

* Available as seamless tubing on an experimental basis only.
**Not available as seamless tubing.

FOR every high temperature application, there's one tube steel that gives you the best life-cost ratio. One steel best answers your particular set of temperaturepressure-corrosion-oxidation conditions. That's why the Timken Company makes the 24 different high temperature steels shown in the box at left.

To find the one best steel for each of your applications, ask the Timken Company metallurgists. They're experts. They know how to balance the various factors against cost-and recommend the analysis that gives you maximum tube life per dollar of cost. They've been doing it for 20 years. And remember-regardless of analysis, you get uniform quality in every Timken® tube because we rigidly control quality at every step from melt shop through final inspection.

Put our "RSQ"-Research, Supply, Quality-to work on your tube problems. Ask the experts! The Timken Roller Bearing Company, Steel & Tube Division, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



Flattened test of 101/2" O.D. by 1.580" wall of 18-8 Cb showing the excellent ductility of large, heavy-wall Timken seamless tubing.



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

CHEMICAL ENGINEERING-March 1954

and HF are liquefied, then sent to a settler where BF_s and butane are separated for re-use. Liquid HF (saturated with BF_s) is separated from the butane by settling. The HF is then recycled to the process. The butane is also recovered and returned to the process.

Product Separation — Hydrocarbons flow from the stripper to a fractionator —via a heater. Unreacted xylene and ethylbenzene taken overhead are condensed. Substantially pure 1,3,5-ethylxylene is withdrawn from the bottom of the fractionator and sent to storage.

Although they do not describe the mechanism of the reaction, the inventors, Arthur P. Lien and David A. McCauley, cite additional examples in their patent, U. S. 2,661,382. The patent has been assigned to Standard Oil Co. (Ind.).

Cut Tar Formation In CS₂ Production

Minimum by-product and tar formation is the claim of this new process for the catalytic conversion of hydrocarbons to carbon disulfide.

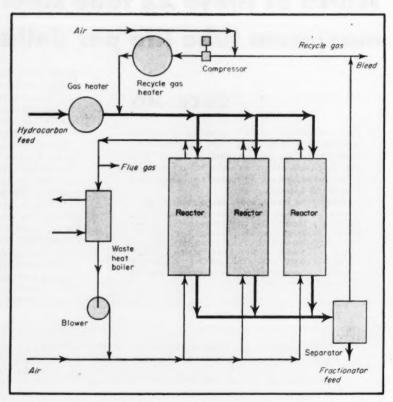
The new method involves the direct mixing of a preheated hydrocarbon gas with sulfur vapors in a catalyst chamber.

Typical run: technical propane (95 mole percent propane, 2 mole percent ethane, 3 mole percent butanes or heavier) is preheated to 1,050 deg. F. in a chamber. (Residence time is about 0.4 sec.) Controlled preheating is necessary to avoid substantial cracking of the C₂ and higher hydrocarbons.

Heated gas then flows into a reaction chamber into which sulfur vapors (50 percent in excess of theory) at 1,145 deg. F. are simultaneously introduced. The reaction is carried out for one hour at 1,112 deg. F. and atmospheric pressure in the presence of an activated alumina catalyst. Space velocity is 850.

Carbon disulfide yield is 89 percent. No tar or coke formation is obtained during the entire reaction period.

The co-inventors, Messrs. Hillis O. Folins, Elmer Miller and Harvey Hennig, describe in detail the operation of the reaction and product recovery. Additional examples are cited to illustrate the process. The patent, U. S. 2,661,267, has been assigned to Food Machinery and Chemical Corp.



Get a Higher Benzene Yield

Small amounts of oxygen are added to the recycle hydrogen gas stream in an improved process for the production of benzene from C₆ petroleum hydrocarbons. Only a trace is needed to double yields.

A prefractionated, preheated (850 to 1000 deg. F.) hydrocarbon feed is mixed with a hot recycle gas stream to which sufficient air or oxygen has been added to maintain a concentration of about 0.2 percent O₂.

The mixture flows to one of three reactors (see cut). Each is packed with a dilute catalyst bed containing a 2:1 mixture of tableted or granular alumina and tableted or pelleted catalyst (molybdenum oxide alumina silica).

Effluent from the onstream reactor passes continuously to a separator.

Products Are Separated—Here liquid products are removed and sent to the benzene fractionator. Separated gases are recycled; excess recycle gas bled off.

While one reactor is onstream, offstream reactors are purged by either flue or inert gases. Passing air over the catalyst bed oxidizes the carbon deposited on the surface of the catalyst particles and regenerates the bed. Recycled flue gas is diluted with the regeneration air, as shown.

The inventors, LaVern Beckberger and Rudolph C. Woerner, have assigned their patent, U. S. 2,661,383, to Sinclair Refining Co.

Here's how the new process ups the benzene yield.

Test Conditions	Pure Hydrogen Feed	Trace of Air	0.5 Volume Percent (Air)
Temperature, deg. F	927	929	928
Pressure, psi	490	490	490
H ₂ /hydrocarbon, molal	12.3	12.9	13.4
Liquid recovery, wt. percent	40.3	74.0	82.0
Benzene, wt. percent/pass	4.8	11.2	13.6

BECKMAN Model W Industrial pH Meter

- A Husky New Addition to America's Most Distinguished Family of



New Savings-New Speed **New Production Advantages**

Beckman - pioneer of virtually every major advancement in pH equipment - now presents a significant new development in industrial pH instruments - the new Model W Industrial pH Meter.

This new industrial pH Meter takes advantage of modern electronic engineering, using miniature and subminiature tubes and printed circuits. It is only one-quarter the size of conventional pH instruments ... and is designed to save maintenance costs by sturdy, moisture-proof construction. The instrument circuit is of a completely new Unitized design - made in three separate plug-in sections, any of which can be interchanged in the field to avoid downtime.

Whatever your industry, whatever your pH problem, get the facts about Beckman pH Control Instruments. Write for Data File No. 86 - 14

Many New and Improved Features

ADVANCED DESIGN Unusually compact, utilizing subminiature components

and printed circuits. ACCURACY

Signal to recorder accurate within ± 0.02 pH. SIMPLIFIED MAINTENANCE

Easily disassembled for quick maintenance . . . plug-in units.

DEPENDABILITY Unaffected by line voltage fluctuations, corrosive atmospheres, vibration, or electrical machinery.

SPLASH PROOF Designed for high humidity and outside exposure conditions.

EXPLOSION PROOF Can be used with air purge in explosive atmospheres. Heavy east iron case available.

Beckman division

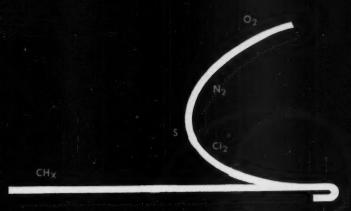
BECKMAN INSTRUMENTS, INC.

Your Checklist of New Equipment Patents

Operation	About	Inventor or Assignee	Patent No
Adsorption	Continuous adsorber-desorber	Standard Oil Development Co	2,660,262
Centrifuging	Centrifugal liquid-solid separation	The Sharples Corp	2,658,620
Chemical reaction	Calcining apparatus	William S. Bowen	2,659,587
	Apparatus for conversion of hydrocarbons	Standard Oil Development Co	2,660,520
	Reactor for gases, using hot contact material	Houdry Process Corp	2,661,322
Crushing and grinding	Rock crusher containing screen and grate	Frank D. Fogle	2,661,158
	Multiple screen pulveriser	Prater Pulveriser Co	2,661,159
	Reversible hammermill with power-driven impactor	Pennsylvania Crusher Co	2,661,160
Crystallization	Fractional crystallization apparatus	The Dow Chemical Co	2.659.761
Distillation	Flow control in bubble towers	Irvin E. Nutter	2,658,737
	Holding device for bubble caps	Gilbert & Barker Manufacturing Co	2,658,738
	Increasing vacuum tower production	Gulf Oil Corp	2,658,863
	Coke remover for tar and petroleum stills	C. A. Lewis, Inc.	2,659,916
Fluid and particle flow	Nonclogging pump	Pacific Pumps, Inc	2,658,453
	Glass-lined pump	The Pfaudler Co	2.658.454
	Fluidized solids system	Standard Oil Co. (Ind.)	2,658,822
	System for elevating contact material	Sun Oil Co	2,659,633
	Adding comminuted solids to liquids flowing in pipes	The Metafiltration Co., Ltd	2,660,560
Gas-solids separation	Liquid washed electrical precipitator	Research Corp	2,658,582
	fumes	California Portland Cement Co	2,659,449
	Pulsation eliminator and gas cleaner	The Fluor Corp	2,659,450
	Centrifugal gas cleaner	The Fluor Corp	2,659,451
	Support for charging electrodes for electrostatic filters	Air-Mase Corp	2,660,260
Heat transfer	Recovery of waste heat from combustible gases	Aktiengesellschaft Fuer Technische Studien	2.658.349
	Detecting leakage between heat transfer fluids	The Lummus Co	2.658.728
	Preheater-type heat exchanger	Saul Horwitz	2.658.729
	Melting furnace	Johns Manville Corp.	2,658,743
Instrumentation and control	Melting point apparatus	John Vanderkamp	2,658,382
	Paramagnetic oxygen-content analyzer for gases	The Hays Corp	2.658.384-5
	Radiation pyrometer	Leeds and Northrup Co	2.658.390
	Controlling fluid flow in a pipe with orifice	Joseph Lucas Ltd	2,658,528
Liquid-liquid separation	Oil Skimmer	Shell Development Co	2,661,094
Solid-liquid separation	Separation of solids from liquids in settling tanks	Texas A. & M. Research Foundation	2,660,557
	Removal of excess liquid from a solid-liquid suspension.	The Vilter Mfg. Co	2,661,095
Solid-solid separation	Sink-float apparatus	Walter Vogel	2,658,618

... And New Process Patents

Product	Process	Inventor or Assignee	Patent No
Carbon black	Production of carbon black. Maintaining activity of cuprous oxide catalyst in oxide-	Columbian Carbon Co	2,659,662-3
	tion of olefins	Shell Development Co	2.659.758
	Preparing nickel powder with large surface area		2,660,523
Fuels.	Preparing natural gas for pipe-line transmission		
F 40000-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	Gasification of coal		2,658,360
	Destructive distillation of oil shale.		2,659,668
Gases			2,661,327
Gams	Air separation. Separation of acetylene from gaseous mixtures by glyco-		2,659,216
	lonitrile	Phillips Petroleum Co	2,659,453
	Removal of nitrogen from mixtures of combustibles		2,660,514
Hydrocarbons	Aromatization reforming	Socony-Vacuum Oil Co., Inc	2,658,858
	Catalytic reforming of hydrocarbons in two stages	Universal Oil Products Co	2,659,692
	Production of isodurene	Standard Oil Co. (Ind.)	2,659,762
	Separation of xylenes by fractional crystallization	California Research Corp	2,659,763
Inorganic chemicals	Production of active magnesium oxide	Food Machinery & Chemical Corp	2,658,814
	Producing fluoride-free uranium oxide.	Union Carbide & Carbon Corp	2,659,655
	Recovery of potassium from sea water	A/S Norduco	2,659,656
	Production of metal fluorides	Pennsylvania Salt Mfg. Co	2,659,657-8
	Ammonium sulfate from acid sludge	Standard Oil Development Co	2,659,659
	Manufacture of alumina	Societe d'Electro-Chimie d'Electro-Metal-	2,000,000
	manuscrate of manuscrate and a contract of the	lurgie et des Acieries Electriques d'Ugine	2,659,660
Metals and ores	Chemical nickel plating	General American Transportation Corp	2,658,839,841-2
	Depression of sulfide sine minerals from concentrates and		
	Extraction of lead from its sulfides.	American Cyanamid Co	2,660,306-7
		Charles B. Foster	2,660,525
0	Electrolytic refining of copper	Canadian Copper Refiners, Ltd	2,660,555
Organic chemicals	Making anhydrides	Les Usines de Melle	2,658,914
	Production of ketones	Universal Oil Products Co	2,658,919
	Manufacture of butyraldehyde	Les Usines de Melle	2,658,921
	Oxidation of hydrocarbons	Celanese Corp. of America	2,659,746
	Preparing esters of nitroacetic acid	Purdue Research Foundation ,	2,659,751
Resins	Preparation of melamine and/or guanidine	American Cyanamid Co	2,658,821-2
	and argines	Universal Oil Products Co	2,659,712
	High temperature polymerization of styrene	Monsanto Chemical Co	2,659,717
	Making polysiloxane resins	General Electric Co	2,661,348
Rubber	Sponge rubber from impregnated synthetic rubber	The Commonwealth Engineering Co. of Ohio	2.659.703
	Recrystallizing or re-stabilizing oriented amorphous		-10001100
	rubber hydrochloride	Leo Peters.	2,660,761
	Blends of styrene-conjugated diene copolymers and	and a constant of the constant	2,000,102
	rubbery materials.	Jasco, Inc.	2.661.339
	Manufacture of cyclized rubber	Rubber-Stichtung	2,661,340
Synthesis gas and synthesis prod-		as a source of the source of t	2,001,010
ueta	Hydrogenation of coal	The Texas Co	2,658,861
***************************************	Removing iron contaminants from synthesis products.	Stanolind Oil & Gas Co	2,658,906
	Catalytic conversion of gaseous reactants	Hydrocarbon Research, Inc.	2,660,598
	Catalytic hydrogenation of carbon monoxide	Ruhrchemie Aktiengesellschaft	
	Cases y sic my or offentation of caroon monoxide	Administration of the state of	2,660,599



petrochemical processes



Foster Wheeler has been actively associated with both the petroleum and chemical industries for over 30 years and has designed and constructed many individual petrochemical process units as well as complete chemical plants.

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now "on stream"

the FOSTER WHEELER process for-

> ammonia synthesis

TEXACO PARTIAL OXIDATION The new non-catalytic oxidation process for the low-cost conversion of hydrocarbons (gaseous or liquid) into Carbon Monoxide and Hydrogen. This process, now in commercial operation, represents the latest development in synthesis gas technology.

POSTER WHEELER LIQUID NITROGEN WASH Design improvements in heat-exchange and liquid Nitrogen contact insure high-purity Hydrogen for subsequent Ammonia synthesis.

CASALE AMMONIA SYNTHESIS Featuring jat-recycling of unconverted feed, Casale, with over 40 plants operating throughout the world, is the lowest-cost synthesis process for the production of liquid anhydrous Ammonia.

Two Ammonia producing plants recently placed "on stream" and four more are in various stages of design and construction. These six plants have a rated capacity of 1000 Tens per day.

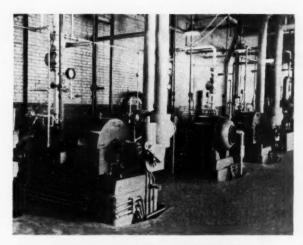
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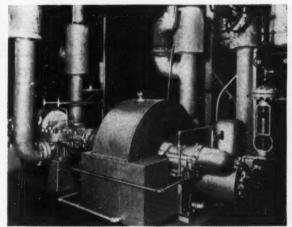
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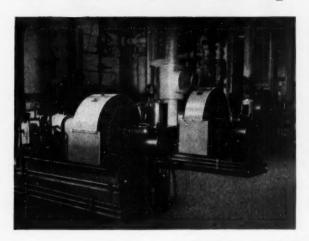
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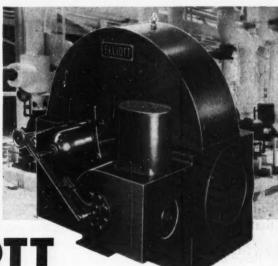






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One plant may have a dozen—another, twenty or so—a third, sixty or more. When these turbines go into a plant, their simple maintenance, easy adaptability, and above all, their unquestioned reliability, soon result in repeat orders wherever plant requirements demand further mechanical drive units. "Put in Elliott turbines and forget your troubles" is the usual sound advice one plant manager gives another.

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YR TURBINES

ducing parts inventory. Using the same basic turbine, six different types of governors may be applied to any one of five different frame sizes. These turbines cover a range up to 2000 hp and 7000 rpm.

You can get the turbines you want in the YR line. See your local Elliott engineer or write Elliott Company, Jeannette, Pa.

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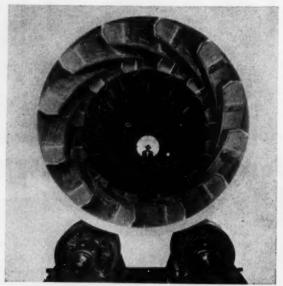


CHEMICAL ENGINEERING—March 1954

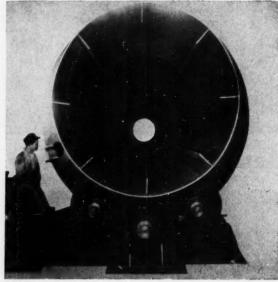
H3-6
STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

Process Equipment News Edited by Calvin S. Cronan

NEW HEATING & COOLING EQUIPMENT



FEED entering here is flash dried to remove surface moisture.



DISCHARGE leaves retention chamber with uniform dryness.

Sensitive Solids Dried Gently

Removing internal moisture from heat-sensitive solids can be bothersome. Here's a new cylinder dryer that does the job without scorching the particles.

Removal of surface moisture, even from heat sensitive materials, usually can be done rapidly at fairly high heat. Once an unsaturated surface condition is reached then temperature must be checked to avoid scorching. And with a low temperature, drying time must be lengthened to allow internal moisture sufficient time for migration and evaporation.

A new approach to this type of drying is offered in the DehydrO-Mat cylindrical dryer. Through use of a varying cross sectional area in one shell this unit changes the velocity of air and solids as they pass through. In this manner product retention time can be controlled. At the same time temperature is adjusted in each zone to give optimum drying.

In a standard horizontal dryer the velocity of material passing through is partly dependent upon the gas-vapor mass velocity. Actually with a dryer of uniform cross section solids velocity tends to increase as the discharge point is approached. Reason is the increase in air-vapor weight through evaporation and the increased dryness and fineness of the particles.

It can be seen that this characteristic of the conventional dryer works against good internal drying for heat sensitive materials. To overcome such a deficiency operators must run at higher temperatures with risk of overdrying or cut down air flow to increase product retention at the expense of capacity.

Fast Start—Operating characteristics of the Dehydro-Mat are said to overcome these shortcomings of the conventional cylinder dryer. Heated air from the furnace enters the narrow dryer throat together with the temperature-sensitive material. Almost instantly a large amount of moisture is evaporated under high velocity and

temperature conditions. Since particle surfaces are saturated the wet bulb temperature stays low and there is no damage.

Next the material moves into a larger diameter section of the dryer and slows down. Rate of evaporation is slower because of lower temperature and air-vapor velocity. Particle surfaces become partially dry. From now on drying becomes principally a function of time.

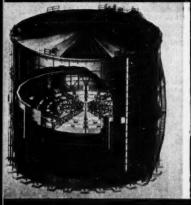
► Slow Finish—Now the particles pass into the retention zone which is a wide diameter section. Temperature is so low that even dry particles will not burn. Holdup time in this zone is a critical factor in final product quality.

Regulation of this retention time depends upon controlling the air volume and properly selecting the unloading flights. When the material is dry it is unloaded mechanically through a narrow throat extending from the enlarged retention chamber. Fines are picked up by the air stream and caught in a cyclone.

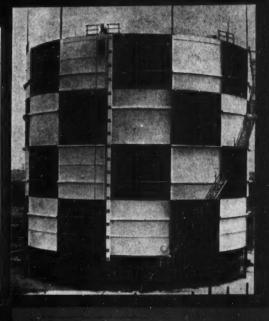
▶ First One a Giant—First installation of the DehydrO-Mat was at New Jersey Menhaden Products Co., Wildwood, N. J., in May 1953. This unit is 60 ft. long with diameters ranging from 6 to 12 ft. It is rotated on four

simple! proved in use!

Wiggins Faskolder







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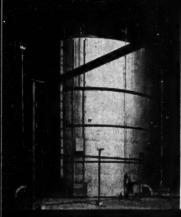
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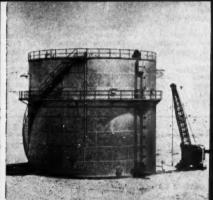
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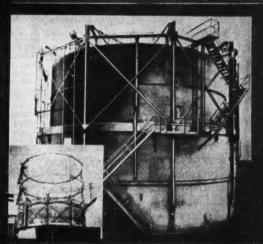
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NEW HEATING & COOLING EQUIPMENT

1-ton trunnions by a 25 hp. motor operating through a fluid drive.

Heat for the dryer is generated in a furnace 12 ft. wide, 18 ft. high and 30 ft. long. Two conical-flame steam-atomizing burners in the furnace are capable of burning 600 gph. of fuel oil. Hot furnace gas and air are mixed in an air tempering chamber just ahead of the dryer throat.

Cyclone collector on exhaust stands 55 ft, high with a girth of 22 ft. Exhaust fan can handle 75,000 cfm. and is driven by a 75 hp. motor.

During the 1953 season of fish processing the DehydrO-Mat operated below full capacity to handle the meal produced from a throughput of 60 tons per hr. of raw fish. Fuel oil consumption averaged 306 gph. to evaporate approximately 17 tons per hr. of water. Efficiency was 70 percent.

It is estimated an ultimate capacity of 90 to 100 tons per hr. of raw fish may be reached. The DehydroO-Mat is expected to handle the full load.

Control of the dryer is handled automatically through an electronic-pneumatic system. Three recording potentiometers receive electric signals from thermocouples in the furnace, throat and backbox. Modulating air motors operated by pneumatic outputs from the controllers move air dampers and set the oil burners. Thus air and fuel flow are controlled and the dryer temperatures held within the desired limits.—Edward Renneburg & Sons Co., 2639 Boston St., Baltimore, Md.

Heat Sensitive Material Dries Fast and Continuously

Uniform drying of heat sensitive materials can be obtained with a new high-speed automatic dryer. Already proven out on gelatin and glue processing, it appears promising for soap, foods, and pharmaceuticals.

Two key features are: maximum exposure of product surface to drying air and ability to supply a low humidity, low temperature air for drying.

Before entering dryer, material such as gelatin is cooled in a heat exchanger to a rubbery consistency. Material is extruded from the exchanger in the form of small diameter lacerated noodles. These noodles are distributed uniformly on the conveyor belt.

In the first dryer section, drying air

New Heating & Cooling Equipment

Cylinder Dryer Tunnel Dryer Standard Exchanger	Combines different diameters for gentle drying
--	--

New Fluids Handling Equipment

	280
Float Trap	Drains corrosive liquids from air, gas lines280
Hose Valve	Throttles flow of corrective liquids
Gate Valve	Of mickel-iron for economy on corrosive service
Mixers	With wariable speed in range of sizes
Strainer	Clives low cost removel of solids from Streams
Fan	Uses highly effective propeller against pressure
Dust Collector	Designed for hopper mounting, cuts handling dust280

New Instruments & Controls

Instrument Calibrator	Works on medium pressure pneumatic instruments282
Annunciator System	Indicates the sequence of off-normal alarms
Flow Meter	Measures flow by voltage induced in liquid
Portable X-Ray Unit	Rrings new flexibility to weld inspection
Moisture Meter	Steps up speed of surface moisture determinations282
Viscometer	For industrial control has 4 percent accuracy252
Flow Regulator	Provides constant rate on slurries and liquids284
Indicator	Has moving strip scale for increased accuracy284
Liquid Level Gage	Uses ultrasonic pulse ranging, gages to 0.01 ft284
Pressure Cell	Converts fluid pressure to proportional voltage284
Thermocouple Well	Combines features of both metals and ceramics284
Automatic Valve	Controls ion exchanger regeneration cycles284
Thermocouple Sealing Gland	
Metal Detector	Sounds warning when any metal passes along belt284

New Electrical & Mechanical Equipment

Blower-Cooled Motor	Gives good cooling independent of motor speed286
Horizontal Turbines	Redesigned to give 50 to 100 percent more power286
Variable-Speed Drive	Can be controlled automatically by electronics286
Self-Bonding Tape	Seals conduits against corrosive action286
Door Switch	Permits door operator use on hazardous location286
Pillow Block	Has hardened zone on inner ball race286

New Packaging & Handling Equipment

Bulk Container Loader	Of metal can be collapsed for return shipment288 For bulk handling has four-wheel steering290
Process Scale Electric Fork Trucks	Utilizes pneumatic force balance principle
Mobile Crane	Includes versatile features for industrial work290
Filling Machine	Can handle up to 15 different bottle styles290

New Processing Equipment

Air Classifier	Offers improved control of product sizing292
Screen Hammermill	Grinds soft materials to medium fineness292
Roll Mill	Features reproducible hydraulic adjustment292
Agitator Coupling	Is magnetic for easy opening of reactor292
Midget Paper Machine	Permits duplication of full-scale operation292
Centrifugal Separator	Is self-cleaning while running at full speed292
Tank Filter	Designed for rapid removal of cake
Cylinder Mixer	Can be used to coat fibers uniformly294
Filter Press	Squeezes cake hydraulically up to 6,000 psi294
Resin Kettles	Developed for pilot plant studies of resins294
Paste Mixer	Offers new design for fast thorough mixing294
In-Line Filter	Has porous Kel-F medium for handling corrosives294

passes vertically back and forth through the bed of material on the belt. At the end of first section semidried product is rescrambled and dropped onto a second conveyor section. Similar vertical streams of low humidity air complete the drying.

An installation now in production is producing 1,800 lb. per hr. of commercially dried gelatin.—Surface Combustion Corp., Toledo 1, Ohio.

Latest process equipment cost

183.5

p. 358 for industry breakdowns.

Standard Exchanger Made of Graphite

A new standard heat exchanger has all wetted surfaces constructed of impervious graphite. This 24-sq. ft. Impervite exchanger is stock item.

There are no gaskets to leak; all joints are cemented with resin.

Since tubes are only 30 in. long, there are no expansion troubles. Tubes have \(\frac{2}{3}\)-in. I.D. and \(1\frac{1}{3}\)-in. O.D. Shell measures 10 in. I.D.

Unit is designed for 100 psi. on both shell and tube side. Upper temperature limit is 350 deg. F.—Falls Industries, Inc., Aurora Road, Solon, Ohio.

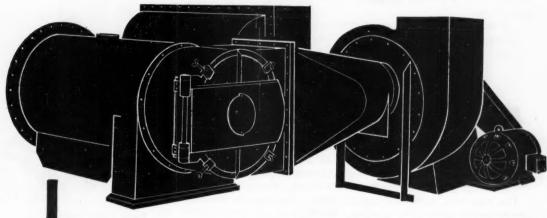
BAKER PERKINS

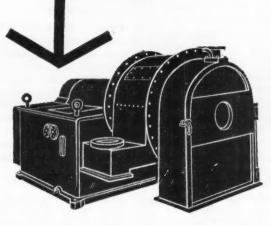
SCREW TYPE
CONCENTRATING FEEDERS

AND B-P CENTRIFUGAL DRYERS

FOR INSTALLATION WITH B-P TYPE S CONTINUOUS CENTRIFUGALS







BAKER PERKINS Concentrating Screw Type Feeders, designed for use with continuous centrifugal installations, insure a uniform rate of feed to the centrifuge and increase the percentage of solids in the feed. The result: higher centrifugal efficiency, lower maintenance costs and greatly improved product quality.

Mounted directly on the hausing of a B-P Type S Continuous Centrifugal, a BAKER PERKINS Centrifugal Dryer provides production line efficiency for the finish drying of solids discharged from the centrifugal. The solids move in a continuous, fast flowing stream through the centrifugal and are discharged directly into the dryer, where the moisture content can be reduced to as low as .01% without interrupting the regular flow of the product.

If your facilities already include a B-P Centrifugal, the Feeder and Dryer attachments will help speed up production, reduce your maintenance and operating costs, and improve the quality of your products.

Consult a B-P sales engineer or write us today for further information.

BAKER PERKINS INC.

CHEMICAL MACHINERY DIVISION, SAGINAW, MICHIGAN

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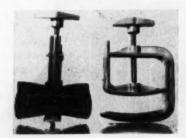
NEW FLUIDS HANDLING EQUIPMENT

Float Trap Vents Liquid From Piping

Corrosive liquids collecting in air, gas or steam systems can be drained off automatically through a new float trap. Draining takes place continuously without permitting escape of air or gas.

Trap mechanism consists of a valve and seat, a lever, and a ball float inside of a case. Liquid, upon entering the unit at the top, raises the float, opening the valve and permitting the escape of the liquid. An accumulation of steam or gas lowers the liquid float, closing the valve.

All float components are made of stainless steel. Unit is designed for 300-lb. pressure and maximum total temperature of 800 deg. F. It is made in sizes from ½ to 2 in.—V. D. Anderson Co., 1935 West 96th St., Cleveland 2, Ohio.



Hose Valve Alds Transfer of Corrosives

This hose valve provides a simple and inexpensive method for throttling flow of corrosive liquids. Contoured design prevents hose damage. It gives complete shutoff against pressures up to 100 psi.

Valve may be installed or removed without disturbing hose connection. Construction is either aluminum or bronze for use on hoses from 1 to 2½ in. I.D.—Carl Buck & Associates, Essex Fells, N. I.

Nickel-Iron Gate Valve Resists Mild Corrosives

A new 125 lb. iron gate valve gives economical service on mildly corrosive installations. The valve is priced considerably lower than either all-stainless or all-monel valves.

Cast iron body and bonnet of the new valves contain 3 percent nickel. This gives an extra margin of corrosion resistance over ordinary cast iron in many services. The valve trim, where corrosion usually does the greatest damage, may be made either of 18-8 Mo stainless steel or monel.

Valve includes an exclusive design feature for iron valves. Disk guides are precision machined. Guides hold disk in perfect alignment during movement, thereby eliminating chatter and excessive wear.—The Lunkenheimer Corp., Box 360, Cincinnati, Ohio.



Variable Speed Mixers In Range of Sizes

Vertical mixers with variable speed drives now are being offered in a range of sizes from ‡ to 25 hp., inclusive. Unit shown is complete with base and stuffing box.

Mixers can provide speeds infinitely variable for correct agitation of materials. They can be provided with stuffing box and lantern gland for pressure or vacuum. There is a choice of the most suitable construction materials.—Conn & Co., 11 South Marion St., Warren, Pa.

Low Cost Strainer For Process Streams

Oversized particles can be removed continuously from process screens by the new low-cost Bantam strainer. Device can handle fibrous or viscous slurries. It is equipped with motordriven scrapers or brusnes to remove particles from strainer openings.

Unit is compact and economical on power consumption. It measures 15 in. high, 17 in. wide and 14 in. deep, including motor. Capacity ranges from 1 to 100 gpm. depending upon the application.—Merco Centrifugal Co., 150 Green St., San Francisco 11, Calif.

Propeller Type Fan Works Against Higher Pressures

A recently developed propeller type fan effectively moves air against pressures as high as 4 in. of water. Ability to work against this pressure lies in the design of the propeller.

The fan is fitted with a curved orifice air-seal ring to eliminate back flow of air at the propeller tips. The vibration-absorbent motor mounting is streamlined to minimize obstruction of the air streams.

Ring and mounting are fabricated of low carbon steel. The propeller is cast aluminum which is machine ground and polished to a high finish.

Fan is available in 28, 36 and 48 in. models.—Hartzell Propeller Fan Co., Piqua, Ohio.



Dust Collector Mounts on Hopper

A recently available dust collector is designed to remove nuisance and toxic dusts raised during handling of dry chemicals. Although essentially a small machine, maximum filter area is attained by collecting dust on the outside of small diameter filter tubes.

Collector pictured above is designed for mounting on a hopper. It has a built-in loading chute and returns dust directly to the hopper when the filter tubes are shaken.

Filter tubes are suspended from a plate just below the exhaust fan. Each tube has an internal support grid to prevent collapse under vacuum.

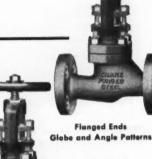
Collectors are available in two capacities: 200 cfm. with 36 sq. ft. of cloth and 400 cfm. with 60 sq. ft.

—Wallace & Tiernan, 25 Main St.,
Belleville 9, N. J.

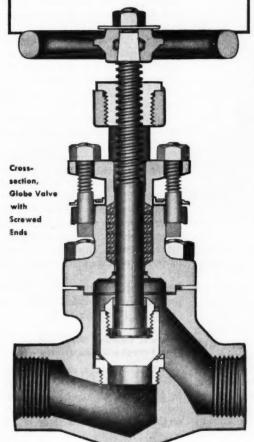
unmatched in dependability

CRANE

chlorine valve



Screwed Ends
Globe and Angle Patterns



now regularly available with screwed ends <u>and</u> flanged ends

Take your choice of patterns in these Crane chlorine valves. They're Crane Quality throughout—designed exclusively for water-free chlorine gas or liquid up to 300° F.

In the cross-section you can see their strong, rugged construction—and the narrow bearing 45° taper disc and seat design that provides positive closure. Corrosion-resistant materials are used at all critical points. Disc, body seat ring and disc stem ring are durable Hastelloy "C." The stem and the gasket at the leak-proof bonnet joint are Monel. In the extra deep stuffing box there's laminated packing specially developed for chlorine service.

You're better equipped for chlorine control with Crane chlorine valves. Sizes ½ to 2-inch.



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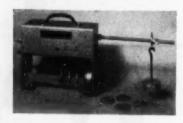
CRANE VALVES

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VALVES . FITTINGS . PIPE . PLUMBING . HEATING

NEW INSTRUMENTS & CONTROLS



Medium Pressure Calibrator Checks Preumatic Instruments

A pneumatic calibrator has been developed for testing and calibrating medium-pressure instruments. It works with instruments operating between 20 in. of water and 25 psi.

Calibrator operates from a 35 psi. air source. It is fully portable; can be used in the field as well as in the shop.

Unit performs the same function as an air loader. It may be adjusted accurately by adding or removing calibrated weights from a weigh beam. -Republic Flow Meter Co., 2240 Diversey Parkway, Chicago 47, Ill.

Annunciator System Indicates Alarm Sequence

A new type of annunciator system automatically indicates the sequence of off-normal alarms. Sequence indicating annunciator pinpoints the cause of trouble by indicating the first variable to go off-normal. This is done either by automatic lockout of subsequent signals or by causing the first signal to be red and subsequent signals white. A pushbutton reset causes the sequence indication to start over again.-Panalarm Products, Inc., 6312 North Broadway, Chicago 40, Ill.

Induced Voltage Measures Flow Rate

Aqueous conductive liquids having resistivities of 10° ohm-centimeters or less can be measured for rate of flow with the Xactronic meter. Accuracy is ±1 percent of full-scale reading. Changes in liquid viscosity, density, turbulence, temperature or line voltage have no effect on this degree of ассигасу.

Metering element consists of a magnet enclosed stainless steel tube. Tube has Teflon liner and attached electrodes which are connected to the indicator or recorder.

As liquid moves through the meter-

ing element a voltage is induced proportional to the average linear flow velocity. Induced voltage then is balanced against a known reference voltage. This gives a measure of flow rate.

The Xactronic meter is made in six sizes from 1 in. to 2 in. It can be used to indicate quantity or rate of flow, to record rate of flow or to control rate of flow. Also various combinations of these functions can be accomplished. - Bowser, Inc., 1365 East Creighton Ave., Fort Wayne,



Portable X-Ray Unit Probes Welds for Flaws

Welds in finished structures and vessels now can be checked for flaws with a convenient Andrex portable X-

Complete unit consists of two parts: an X-ray unit containing X-ray tube, high voltage transformer, filament transformer, cooling pump; and a control unit comprising instrument, regulating devices, exposure timer, safety relays, etc. With this arrangement all high tension parts have been combined in one single all-welded steel tank. High tension cables, cooling connection, separate transformers and cooling pump have been completely eliminated.

The X-ray part of the unit comes in three sizes; 120, 175, 250 kvp., in weights of 130, 180 and 275 lb., respectively. Control unit weighs 90

With the 175 kvp. unit it is possible to radiograph 2 in. of steel with an exposure time of 2 min, at a focused film distance of 20 in .-- Holger & Andreasen, Inc., 703 Market St., San Francisco 3, Calif.



Moisture Meter Gives Fast Results

Surface moisture content on solid particles can be determined rapidly and accurately with the Olivo moisture meter.

Here's how the meter works. weighed quantity of sample is hermetically sealed into the instrument with a glass capsule of calcium car-bide. Vigorous shaking breaks the capsule mixing its contents with the sample. Reaction between the calcium carbide and sample moisture produces acetylene gas.

Gas exerts pressure on the inner walls of the chamber. This pressure is recorded on the meter in terms of

percent surface moisture.

When properly calibrated this meter is accurate within 2 percent, as compared to standard air-dry surface moisture results. This means a sample having an air-dry surface moisture of 10 percent would have a comparative Olivo surface moisture of 10.2 to 9.8 percent.-Heyl & Paterson, Inc., 55 Water St., Pittsburgh 22, Pa.

Process Control Viscometer Has Increased Sensitivity

Modification of a standard industrial viscometer has increased accuracy to 1 percent. By comparison most industrial viscometers have accuracies on the order of 1 to 2 percent. High accuracy is obtained by suppressing the zero reading.

Viscosity is measured by the time required for a piston dropping by gravity to expel liquid from a cylinder. This measurement is electrically transmitted to the recorder and converted

into a chart reading.

Viscometers of this type are available for ranges between 0.2 and 200,-000 centipoises. Instrument can be used for viscosity measurements under pressure or vacuum and can be fur-

SAFEST way to handle acid corrosion

SAFE from corresion

SAFE from contamination

SAFE for plant and personnel

Lapp CHEMICAL PORCELAIN

For problems involving severe corrosion, or elimination of contamination, best bet is a material chemically inert to product being handled—and it should be hard, smooth, strong, and non-porous.

That's a description of Lapp Chemical Porcelain—and a list of characteristics which have won it a permanent place in hundreds of plants, and hundreds of proc-

esses, where no other material ever gave as satisfactory service.

The bonus is that it costs a lot less initially than most corrosion-resistant alloys and lined equipment. And the economy is increased in the fact that it almost never needs maintenance or replacement.

We want to make special mention of the item "safe for plant and personnel." Lapp Porcelain is much tougher and stronger than most people give it credit for. However, under severe shock, physical or thermal, it will break. In the past we've supplied our equipment with several types of armor. Today, we've got the simplest, most economical, and best. We call it TUFCLAD. It consists of multiple layers of heavy fiberglass woven cloth, impregnated and bonded with an Epoxide resin. This armor shell acts as a cushion against impact damage, and insulator against thermal shock. But most important, it is of itself strong and tough—will hold line pressures even when porcelain is cracked or broken.

ANGLE AND Y-VALVES 1/2" TO 6"
PLUG COCKS 1", 11/2", 2"
FLUSH VALVES FOR 3", 4", 5"
TANK OUTLETS
PIPE AND FITTINGS 1/2" TO 8"
TOWERS 12", 18", 24"
RASCHIC RINGS 3/4" TO 3"

For your problem of corrosion or contamination, Lapp Chemical Porcelain may bring you a new standard of untroubled service, improved quality and lowered cost. Write for description and specifications. Lapp Insulator Co., Inc., Process Equipment Division, 300 Wendell St., Le Roy, N. Y.

TOWER PLATES

NEW INSTRUMENTS & CONTROLS

nished to meet explosion-proof requirements.—Norcross Corp., Dept. N-13, Newton 58, Mass.



Flow Rate Regulator Controls Light Slurries

A new Kates regulator design will control flow rates of light slurries as well as clear liquid. This direct-acting unit maintains constant rate despite fluctuation in either inlet or outlet pressure.

Regulator has been engineered to be self-cleaning. Its unique downflow design prevents clogging and blocking by solids. It will drain completely when piping system is drained.

Type SA regulators are available with steel casing and stainless trim and valves or Type 316 stainless steel throughout. Models are available to handle capacities from 2 to 550 gpm.—W. A. Kates Co., 430 Waukegan Rd., Deerfield, Ill.

Moving Scale Indicator Increases Reading Accuracy

A moving strip-scale behind a fixed horizontal hairline is being used on a remote indicating device to give increased reading accuracy. Separation between the scale and the hairline is very small. This combined with eyelevel reading virtually eliminates the problem of parallax.

Although the current model is designed for use with a flow meter it can be adapted to any primary instrument.

Total scale length is 72 in. Accuracy is better than one part in two thousand and scale divisions are 1 in. apart. The 35-mm. film scale can be calibrated in any units desired with maximum range of 5.5 to 1.—Fischer & Porter Co., 10A Jacksonville Rd., Hatboro, Pa.

Ultrasonic Pulse Gages Liquid Level

Liquid levels can be gaged within ± 0.01 ft. using an ultrasonic pulse ranging technique. Model SL-101 liquid level indicator system also is suitable for precise location of the demarcation line between immiscible liquids.

A self-contained calibration system automatically compensates for changes in variables. Actual gaging is done by a transducer. The indicating instrument may be located anywhere within a radius of 2,000 ft. A number of transducer equipped tanks may be gaged with one common indicator.—Bogue Electric Mfg. Co., 52 Iowa Ave., Paterson 3, N. J.

Pressure Cell Is Sensitive and Accurate

New transducer Dynaformer pressure cell gives a highly accurate pressure measurement. Element converts fluid pressure to a proportional a.c. voltage. An electronic resistance Dynalog instrument measures this voltage in terms of pressure.

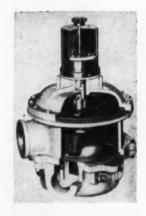
Dynaformer cell consists of a Bourdon pressure spring linked to a copper ring which surrounds the iron core of a differential transformer. Responding to fluid pressure the spring positions the ring. A differential voltage, proportional to the fluid pressure, is induced in the output winding.

Cell is accurate to within ± ½ percent at any point. Pressure ranges are available between 0 to 30 in. Hg. and 0 to 10,000 psi.—The Foxboro Co., Foxboro, Mass.

Metal Ceramic Tube Protects Thermocouple

Advantages offered both by metals and ceramics have been combined in a new thermocouple protection tube. The metal-ceramic LT-1 thermocouple well combines the thermal conductivity and shock resistance of metal with the oxidation and deformation resistance of ceramics.

The well has a wall thickness of only & in. Thermal conductivity is about the same as cast iron. Well is available in lengths of 12, 18 and 24 in. It can also be supplied in a complete thermocouple assembly.—
The Bristol Co., Waterbury 20, Conn.



ion Exchange Regenerations Controlled by Automatic Valve

Regeneration cycles for water softener, filter and ion exchanger systems can be controlled by a new 2-in. multiport valve. Valve operation is regulated by automatic electrical controls and operated by a time clock.

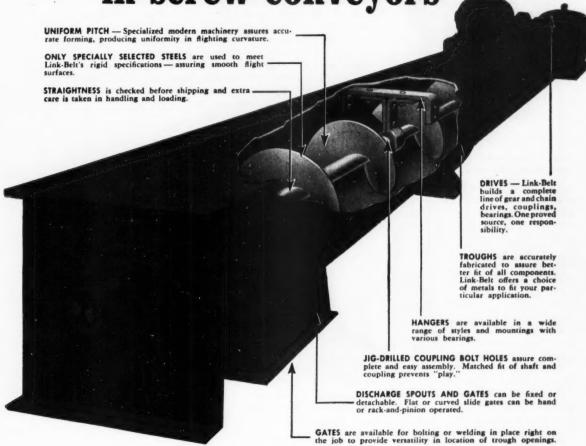
Porting changes within the valve are provided through an electrical timer. Incorporated within the timer are four adjustable cams. These correspond to the backwash, brine injection, rinse and service flow positions.

Cams control a motor-operated pilot valve which changes water pressure above a rubber diaphragm in the valve bonnet. Water pressure variations cause stem plate assembly in the valve to raise and lower.—Automatic Pump and Softener Corp., 2412 Grant Ave., Rockford, Ill.

Thermocouple sealing gland permits changing exposed wire thermocouples without reducing pressure on system. C-U-P glands can seal several thousand pounds per square inch. Temperature range is determined by the sealant selected.—Conax Corp., 4515 Main St., Buffalo 21, N. Y.

Metal detector operates electronically to detect any kind of metal or alloys, magnetic or non-magnetic. Instrument will operate at conveyor speeds from 25 to 1,000 ft. per min. When metal is detected instrument can sound a warning alarm, light a light or stop the conveyor belt.—Radio Corp. of America, Camden, N. I.

There <u>are</u> important differences in screw conveyors



LINK-BELT gives you sound engineering plus accuracy of manufacture for top performance

HEN you buy a Link-Belt Screw Conveyor, you can be sure of efficient operation plus long-life, low-maintenance service. Link-Belt builds all types and sizes of components—you get the screw conveyor that's right for your job... with all components completely integrated. What's more, long-lasting efficiency is assured, thanks to Link-Belt's unequalled accuracy of manufacture. Let your nearby Link-Belt sales representative or distributor point out the many important differences in screw conveyors. And be sure he gives you a copy of new Book 2289.

Get this complete screw conveyor book—92 pages of pre-engineered selection and application data. Ask for Book 2289.



LINK BELT

SCREW CONVEYORS

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle; Scarboro, Toronto and Elmira, Ont. (Canada); Springs (South Africa); Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

NEW ELECTRICAL & MECHANICAL EQUIPMENT



Totally Enclosed D.C. Motor Cooled By Blowers

A new totally enclosed, unit-cooled, d. c. motor has been designed for use in severe atmospheres. Available in ratings from 15 to 200 hp. motor features 50 percent greater heat transfer in a unit 37 percent smaller than previous designs.

A double system of blowers assures rapid cooling. One blower assembly forces cooling air from the room through the external passages of the cooler. The other forces internal motor air through the closed internal passages of the air cooler.

Cooling units are mounted completely within the over-all length and width of the motors. They permit operation at extremely low speeds for long periods of time. Ventilation is independent of motor speed. A thermostatic relay protects the main motor in case of blower-motor failure.

—General Electric Co., Schenectady 5, N. Y.

Horizontal Turbines Boast More Power

The DH horizontal turbine line now boasts from 50 to 100 percent more power on all models. Increase was obtained by adding one steam nozzle to both one-nozzle and two-nozzle machines.

New, larger, improved carbon-ring packing glands increase maximum back-pressure from 50 to 75 psi. Also, redesign has eliminated need for packing on valve stems for high-pressure and high-temperature units. One of the models now is equipped with water-cooled bearings.—Dean Hill Pump Co., 4040 East 16th St., Indianapolis 7, Ind.

Variable Speed Drive Controlled by Signals

Application versatility is possible with a new line of electronically-controlled variable-speed drives. Drive speed can be made responsive to signals based on speed, load, current, voltage, pressure, light, temperature, or time.

Speedranger units operate on either 2 or 3 phase a. c. power. Input is converted to d. c. by a motor-generator set and tube-type electronic rectifiers. Output d. c. power drives a variable-speed, shunt-wound motor.

Type GV drives are rated from 2 to 10 hp.; type EV units are built in sizes from ½ to 1½ hp. Basic speeds for type GV are 2,400, 1,750 and 1,150 rpm.; for type EV 2,400 rpm. All are adjustable down to ½ of basic speed.

Optional features offered with both types are jogging, reversing, dynamic braking and special duty cycles.— Master Electric Co., 126 Davis Ave., Dayton, Ohio



Self-Bonding Tape Seals Against Corrosion

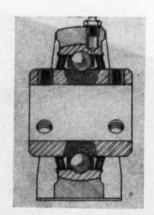
A polyethylene tape for conduit joints withstands corrosive action. When applied to the joint, Bi-Seal Type 2 fuses into a solid mass of corrosion-resistant insulation. Fusion is so complete that within minutes after application it is imposible to delaminate the insulation.

Self-bonding and fusing action completely eliminates chance for lateral penetration of corrosive fumes. Tape conforms to irregular shapes and may be applied to any type coupling or connector.—Bishop Mfg. Corp., 158 Factory St., Cedar Grove, N. J.

Explosion-Proof Switch Controls Boor Opening

A new explosion-proof control switch permits installation of door operators wherever hazardous conditions exist. Magic Door operators can be used for single, double and bi-fold swinging doors as well as for single and bi-parting sliding doors.

Switch is enclosed in a cast-iron housing meeting NEMA Type VII, Class 1, Group C and D requirements. This classification is suitable for explosive gas atmospheres such as ethyl gasoline, petroleum naphtha, alcohol, acetone, lacquer solvent and natural gas vapors. Switch can be located for hand use at elbow height or for tiptoe operation.—The Stanley Works, Magic Door Div., 195 Lake St., New Britain, Conn.



Ball Bearing Pillow Block Has Zone-Hardened Race

Through use of a patented, induction-heating process the inner race ring of Sealmaster ball bearing units is zone-hardened on the ball path section only. Ball races are of the double extended type.

Extended portions of the ball race are not hardened. Thus hardened set screw threads can bind tightly against the soft race threads for positive race-to-shaft locking.

Double extension of the inner race ring affords maximum support of bearing on shaft. A positive lock is guaranteed between inner race of the bearing and the shaft.

This positive locking feature effectively reduces shaft wear and fretting corrosion. Shock and vibration resistance are reduced since most of the inner race remains relatively soft and tough.

Zone-hardening is accomplished by completely automatic induction heating and high-speed oil quenching. This produces a metallurgical structure much finer than achieved by conventional heat-treating.—Stephens-Adamson Mfg. Co., Aurora, Ill.



I. W. McKINNEY, CAMERON SALES ENGINEER, HOUSTON OFFICE.

LIFT-PLUGS FOR DIFFICULT SERVICES!

Cameron Non-Lubricated Lift-Plug Valves excel in many services but are most outstanding in the difficult services, such as LPG, corrosive acids, caustics, molten metals, pressures to 5000 lbs. and almost absolute vacuum. If you have valve problems in your plant, chances are Cameron Lift-Plugs can solve them. We welcome your inquiry.

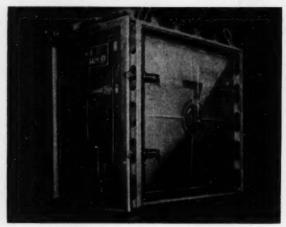


LPG storage tanks in a Gulf Coast petro-chemical plant. LPG is one of many difficult services where Comeron Lift-Plugs are doing an outstanding job.

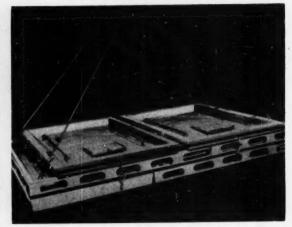
ameron IRON WORKS, INC. P. O. BOX 1212, HOUSTON, TEXAS

Export Office: 7912 Empire State Bldg., New York City

NEW PACKAGING & HANDLING EQUIPMENT



SET-UP metal container gives full protection to bulk lading.



KNOCKED-DOWN box saves shipping expense on return.

Knock-Down Box Pares Costs

You've got a greater chance of payloads both ways with this metal bulk container. Or faced with "dead head" return you can collapse it and save on shipping space.

It doesn't make a bit of difference whether you are shipping solids, liquids or packaged goods. All types of commodities are shipped conveniently and safely in this new general purpose, collapsible container. There is said to be no danger of contamination between successive lots of entirely different kinds of commodities. This trait ups chances for two-way payloads.

And the variety of substances transported in this fashion is wide indeed. Already they range from lime, salt, manganese dioxide, copper sulfate and titanium ore to corrosive acids, solvents and edible oils to powdered insecticides in cardboard boxes.

If you should happen to face shipping costs on return of empty containers you can pare them to a fraction of expected amount. Reason: despite its bulk capacity this container will knock down to a collapsed volume that's only 38 percent of working volume.

You may not have heard of the Mick 7 container because it is just being introduced in the U. S. A. after initial development and testing in France. Despite its newness it already has achieved official acceptance by the French National Railways and the International Union of Railways.

► Simple Construction — Container consists of six panels. Four are hinged to each other by piano type hinges. The other two form the hinged, gasketed removable doors. When doors are in place they complete a rigid, rugged, waterproof structure able to withstand hard usage.

By removing the two doors the other four panels can be folded together into a flat compact collapsed package. Package is completed by fastening the doors on top of the folded section. Fixtures for fastening are part of the structure.

Construction may be either steel or a light alloy such as aluminum or magnesium. Channel sections along the edges provide extra strength and protection. Joints are all welded. All fixtures are cast steel.

Vital Statistics for New Container

	Open	Folded	
Over-all dimensions			
Height, ft.	6.0	1.08	
Length, ft	5.25	8.75	
Width, ft.	4.0	5.08	
Volume, cu. ft.	126.0		
Internal dimensions			
Height, ft.	5.42		
Length, ft.	4.92		
Width, ft.	3.33		
Volume, cu. ft.	92.0		
Tare			
Steel model, lb.		924	
Light alloy model.	lb.	441	
Load. Ib	8.0	00-10 800	í

On the bottom are two steel skids positioned for lift truck handling and stacking of the containers. Lifting rings on the corners also serve for lashing box in place on conveyance. Loading and Unloading—Pulverized or other bulk material is loaded through a manhole in the top, after box has been completely assembled with both doors closed. To discharge the solids a lifting sling is attached to two of the rings. Container then is lifted until edge diagonally opposite is just touching the floor. By opening the door, contents can be dumped immediately and completely.

With doors opening to the full cross sectional area, discharge is clean even when the load is sticky or binding. If necessary it is possible to enter and clean the interior with broom scraper or hose.

Packaged goods can be stacked inside the box through one open door. Filled container can be locked by padlock for protection against pilferage.

Liquids are transported by using a one-piece plastic liner inside the box. Neck of liner is fastened to the manhole by a suitable fitting. As liquid flows into the bag, the bag expands and fills the space within the container. Drainage is done either by pumping or syphoning.

Use of plastic bag makes the container truly liquid-tight. The container walls provide the supporting structure.

Bags are relatively low in cost. Thus if lading is to be changed to another material where contamination must be avoided a new bag can be installed.

"Sure, your mixing problems are DIFFERENT ... that's why you need MIXING EQUIPMENT ENGINEERED to meet your specific requirements"



Having helped in the successful solution of hundreds of chemical process and food industry mixing problems, we know how different these jobs can be . . . there are hardly any two that can be handled in exactly the same way. And because these mixing, blending, reaction jobs are so widely diversified, you need the kind of equipment and experience that will give you the best solution, in the shortest time, at the lowest possible cost.

That's where we come in. We have the production "know-how" and we have the equipment. Simpson Mix-Mullers are the answer to any mixing problem involving dry, semi-dry or pasty materials, and are without equal when it comes to thorough mixing and blending to exacting specifications . . . thanks to the controlled, proved Mulling Principle of Mixing!

Take a good look at the typical examples of the way in which Simpson Mix-Mullers are helping scores of widely diversified chemical process and food plants to do a better, faster mixing job at lower cost. Why not submit your mixing problems to us for analysis?

... here's how we solved some typically different mixing problems



PILOT PLANT WORK
... View shows a laboratory size Simpson
Mix-Muller, specially
equipped for mixing
under vacuum and
heat, in pre-testing
trial batches in pilot
plant work for electrical porcelain production



EXPLOSION-RESISTANT
... This No. 0 Simpson Mix-Muller was
specially equipped to
reduce friction and
heat to a minimum
for the safe preparation of explosive materials. Completely
jacketed for water
circulation.



corrosion-resistant
... This No. 2 Simpson Mix-Muller has
stainless steel mixing
surfaces for corrosion-resistance and
improved sanitation.
Unit is also jacketed
for circulation of
steam to aid in chocolate preparation.



ELECTRICALLY-HEATED ... Special 24-in. laboratory size Mix-Muller, with thermostatically - controlled electric heating elements. Designed to operate under vacuum or pressure in preparing experimental batches. Equipped with stainless steel pan.



WATER-COOLED ... These special No. 2 stainless clad Simpson Mix-Mullers are equipped with jacketed sides and bottom for full water circulation, to control heat produced by chemical reaction in mixing of storage battery plate pastes.



HOT OIL CIRCULATION
. . . This versatile
No. 00 Mix-Muller
prepares an infiniteily variable number
of different mixes
under widely varied
conditions. Equipped
for vacuum and pressure, and jacketed for
hot oil circulation.

USE OUR LABORATORY SERVICE We maintain a compretely equipped modern testing laboratory for determining the results of mixing different materials in Simpson Mix-Mullers. A confidential test in our laboratory will prove what a Mix-Muller will or will not do for you. Write for further desails

We will welcome an opportunity to discuss your "different" mixing problems with you. A letter or a phone call will place our experience at your disposal.

SIMPSON MIX-MULLER DIVISION

NATIONAL ENGINEERING CO., 636 Machinery Hall Bldg., Chicago 6, III.



NEW PACKAGING & HANDLING EQUIPMENT

At other times it is an easy matter to clean the bag with a minimum of labor.—American Premaberg Co., 32-36 West 40th St., New York 18, N. Y.



Four Wheel Steering Brings Nimbleness to Londer

How to cut a sharp corner is demonstrated by this new four-wheel steering Shoveloader. Despite an over-all length of 19 ft., this heavy-duty loader has an inside turning radius of only 7 ft. 6 in. It uses the same steering principle as a hook and ladder fire truck.

Unit is equipped with positive fourwheel drive. Power steering on all four wheels may be had as an optional feature.—Baker-Lull Corp., Dept. KP, 314 West 90th St., Minneapolis, Minn.

Process Scale Operates Pneumatically

A pneumatic weighing scale for batch or continuous processes operates without springs, knife edges or lever system. Scale is completely pneumatic utilizing the force-balance principle. No electricity is needed even for remote indications or control.

A pneumatic transmitter translates a variable force or weight into a pneumatic output signal. The signal will vary in proportion to the magnitude of force or weight applied. A precision pressure gage actuated by the pneumatic signal is calibrated in terms of weight units. Recording and/or con-

trolling functions are readily obtainable.

Scale operates on an air supply with a minimum pressure of 50 psi. Indicating errors are never greater than 0.25 percent of range. Reproducibility is better than one part in 3,000.—Weighing Components, Inc., 64 Fulmor Rd., Hatboro, Pa.

Electric Fork Trucks Approved for Hazardous Areas

Underwriters' Laboratories has approved a line of electric fork lift trucks for use in hazardous locations involving fire or explosion. This is reported the first time such approval has been given to an industrial truck.

Trucks carrying the Underwriters' Type EX label will be available in 2,000, 3,000, or 4,000-lb. capacity models. According to the National Electric Code, Type EX trucks may be used where atmospheres contain gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors, and natural gas. — Automatic Transportation Co., 149 West 87th St., Chicago 20. III.

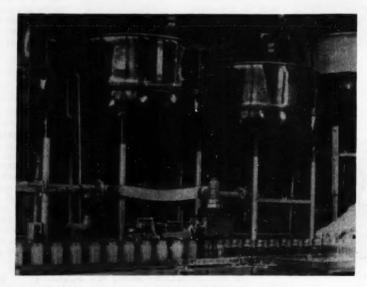


Mobile Crane Works Indoors or Outdoors

Adapted from a machine originally designed for the Navy a new hydraulic crane combines the best features of crawler, industrial shop cranes and truck and erection cranes. Machine is self-propelled and light weight.

Crane can perform four functions: turntable rotation, boom elevation, raising and lowering of cable and hook, and power extension and retraction of the boom.

Boom can be rotated 360 deg. Horizontal reach from center of rotation is 24 ft.; vertical lift from ground level to hook is 24 ft. Over-all height is 9 ft.; over-all width is 8 ft. These dimensions meet door and aisle requirements.—Austin-Western Co., Aurora, III.



FILLING MACHINE HANDLES 15 DIFFERENT BOTTLES

Ability to handle 15 different bottle styles led to selection of this automatic filling machine by a leading Pacific Coast cleaner and polish manufacturing firm. Through use of this Simplex machine production has been increased 30 percent without any increase of labor. Machine can handle soft soap, paste, medicine, wax, cosmetics, grease, ink, paint and other liquid or soft substances. Filling rate is 20 to 60 containers per minute.—F. L. Burt Co., 571 7th St., San Francisco 3, Calif.

The Dramatic Answer for Top Efficiency in Guarding Against Tramp Iron Danger

it's the new

YOU'LL be delighted with this great new "Magnalarm" line. Here's why:

The new "Magnalarm" line . . . complete in 3 magnetic strengths and 35 standard

strengths and 35 standard sizes from 4" to 72"...combines a revolutionary automatic alarm system with Eriez permanent magnetic separators... developed to tell you automatically when separators have accumulated so much tramp iron that their efficiency is lowered below minimum requirements!

How would you want to be signaled? By a light on the machine or in a far-off office? By a bell or a buzzer sounding? Or, for ultimate safety, by your machinery shutting off? You can be signaled by any of these optional systems. And, just to make positive the tramp iron is removed, the light stays on or the bell keeps sounding or the machinery stays shut off until the magnet face is cleaned!

WHAT BENEFITS "MAGNALARM" BRINGS TO YOU:

- 1. Assures the greatest possible magnetic efficiency!
- Affords maximum protection against fires, machinery damage and product contamination caused by tramp iron!
- Saves time . . . unnecessary shut downs for inspections are discontinued!
- 4. Gives you quality control on the tramp iron to be found in various runs of materials!
- 5. Plus all the other advantages of Permanent Magnets!

HOW "MAGNALARM" WORKS:

The heart of the "Magnalarm" is the ferrometer . . . a device which measures the accumulation of tramp iron on a magnet. "Magnalarm" opens and closes a circuit to which your special alarm is attached when a pre-set amount of tramp iron is caught. This degree is pre-set at the Eriez factory to meet the normal requirements . . . but it may easily be changed by you at your location if a change is desired.

The only electricity used is that which sets off the electrical device connected with the "Magnalarm". No other electricity is used because the Erice separator is still a self-contained, non-electric unit which holds its magnetic power indefinitely. The electricity used in the alarm in no way affects the strength and magnetic field of the powerful magnetic material, ALNICO V.

COST AND INSTALLATION

"Magnalarms" are easy to install (simple installation instructions come with each unit) and do not require any maintenance until the signal is given for cleaning. The cost of the "Magnalarm", fully guaranteed by Eriez, is but a fraction more than that of an ordinary old-type magnetic separator!

No one else has "Magnalarm" or anything like it! Count on Eriez to stay in front! Count on Eriez to give you the latest in magnetic equipment.

TYPICAL "MAGNALARM" SITUATIONS:

- A maintenance man who is in charge of cleaning the magnets overlooks a magnetic separator
 but he is quickly reminded by the "Magnalarm" before it is too late!
- A magnetic separator in a difficult position or in a remote spot misses inspection and cleaning . . . but with the "Magnalarm" acting as an automatic "baby sitter", no one has to waste time
- or effort "inspecting" ... the "Magnalarm" notifies hose concerned that cleaning time has come.
- come.

 3. A batch of raw material, for example, might contain an unusual amount of tramp iron which the Eriez magnetic separator catches..., but is "offguard" until the magnet is cleaned. "Magnalarm" tells you when this happens.





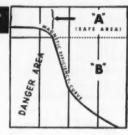
An Eriez "Magnalarm" installed on a Gravity Flow Hump signals the presence of tramp iron in this hard-to-get-to, enclosed, food processing line.



Eriez Double Row "Magnalarm" installation assures top efficiency in keeping tramp iron out of this rubber reclaiming line, protecting the sizing screens ahead.

MAGNETIC EFFICIENCY AS GOVERNED BY TRAMP IRON ACCUMULATION

"Magnalarm's" signaling action makes sure you operate only in the strong, safe range marked "A". An ordinary plate magnet's strength will be lowered by tramp iron accumulation to the inefficient operating danger area marked "B" unless plates are checked and cleaned frequently.



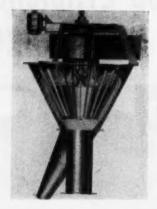
WRITE FOR EXCITING, FULL DETAILS

Even though we have developed "Magnalarm" and are naturally in love with it, we think you'll get a thrill too, when reading about the full story of "Magnalarm" in a free brochure which is yours for the asking. Sizes. Magnetic strengths. Types of installation. Construction. Electrical circuits. Type of ferrometer element. Special features. Even how to order. It's all there.

Fill out the easy coupon below. Do it yourself . . . or do it for someone within your organization who will be grateful for the information.

Eriez Manufacturing Company 74C Magnet Drive, Frie, Pa. Send me the "MAGNALARM" literature Name Address City State

NEW PROCESSING EQUIPMENT



Air Classifler Covers Greater Range

Improved control of product sizing is obtained with the Gyrotor air classifier. Used in dry grinding circuits unit is said to classify over a wider particle size range.

Airborne solids enter classifier through inlet at bottom. They pass up and around rotor. In the annular space between rotor and casing coarser particles are thrown out of the air stream. They descend along the outer casing to the over-size discharge

at the lower left.

At the top of the casing, air moves radially inward and downward eddying in a doughnut shaped pattern. Any coarse particles remaining in the air stream are thrown against the top surface of the rotor. Then they are slung outwardly along the top plate re-entering the annular space. Only the finer particles are carried up through the central discharge outlet.

Product size is controlled by speed of rotation of the Gyrotor. Good classification efficiency is aided by countercurrent flow of coarse particles and incoming feed in the annular space. — Hardinge Co., Inc., 240 Arch St., York, Pa.

Screen Hammermill Grinds Soft Material

Soft material such as food products, dye colors, filter éakes, etc., may be ground to medium fineness by the Ray-Ducer pulverizer. Unit is a screen hammer-type mill available in three sizes to handle a wide range of capacities.

The mill, feeder, motors and variable-speed feeder drive are mounted on a relatively small metal base. Al-

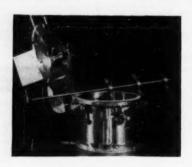
though compact there is good accessibility for inspection, maintenance or screen changes.—Combustion Engineering, Inc., Raymond Div., 1315 North Branch St., Chicago 22, Ill.

Roll Mill Adjustment Reproduces with Ease

Complete hydraulic adjustment is provided on the No. 52 TF three-roll mill. Roll pressure is indicated on gages. Minimum effort turns the two handwheels activating the hydraulic roll adjustment.

Mill has a floating middle roll. When premixing is desired between back and middle roll there is a quick-acting device for disengaging the front roll. Once premixing is completed device is released and middle roll adjusts to front roll for finished grind and take-off.

Mills are available in a range of sizes from 4½ x 10 in. to 16 x 40 in.— Charles Ross & Son Co., 148-156 Classon Ave., Brooklyn 5, N. Y.



Magnetic Agitator Coupling Makes Reactor Open Easily

Quick opening for cleaning and charging is featured in the Access-A-Bilt model chemical reactor.

A positive locking magnetic coupling device allows the agitator shaft to be split near the top. Hinged head of the vat then may be swung open like a lid. It is a one-man operation, performed without necessity of using an overhead crane.

When reactor head is closed a simple rotator bar facilitates alignment of the magnetic coupling.

Reactor is constructed entirely of stainless steel. It can be supplied in any size to 100 gal. in pressures to 250 psi.—Stainless & Steel Products Co., 1000 Berry Ave., St. Paul 4, Minn.

Midget Paper Machine Duplicates Full-Scale Units

Experimental runs of paper now can be produced without tieing-up full-size machine production. It's done by the P & W Midget Four-drinier paper machine.

Quality of paper from this machine is comparable to the product from a full-size Fourdrinier machine. Trim is only 9 in., thereby offering substantial savings of material.

Machine output is 35 lb. of paper per hr. max. at speeds up to 8 ft. per min. Only one operator is required and power consumption is 2.5 kw.—Parsons & Whittemore, Inc., 250 Park Ave., New York 17, N. Y.



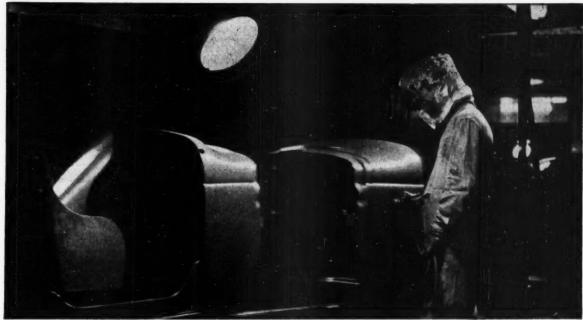
Centrifugal Bowl Cleans Without Shutdown

A self-cleaning centrifugal separator now is available in the United States, Canada and Central America. It is the Titan machine from Denmark that has enjoyed world-wide usage for a number of years.

Titan centrifuges are said to be selfcleaning while operating at full speed. Rotation of a four-way valve through one complete turn completes the cleaning cycle in less than 10 sec. Sludge at any viscosity is claimed to be discharged with ease. Down time for bowl cleaning is eliminated and loss of production time stopped.— Pitmar Centrifugal Machine Corp., 10 East Fayette St., Baltimore, Md.

Tank Filter Cake Removed in a Jiffy

Manpower needs for tank-filter operation have been sliced on the new model MCR. Filter can be opened with all plates exposed in 60 sec. It's



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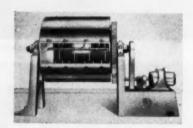
ENJAY COMPANY, INC. . 15 West 51st Street, New York 19, N. Y.

NEW PROCESSING EQUIPMENT

available in units from 100 to 2,000 sq. ft. of filtering surface.

To open, you release one lever. The tank is retracted with the flip of a switch without disconnecting pipe connections. Leaves can be cleaned by jet spray wash-off, backwashing, a combination of both, or by hand. It is said one man can open the filter, clean a 2,000 lb. cake and return the filter to operation again in less than 30 min.

Filters can be furnished in a wide selection of construction materials, including rubber or plastic lining when desired.—Sparkler Mfg. Co., Mundelein, Ill.



Cylinder Mixer Uniformly Coats Fibers

Asbestos fibers are being uniformly coated with carbon black through use of a special cylinder mixer. A finished batch is loose and fibrous throughout with individual fibers thoroughly coated.

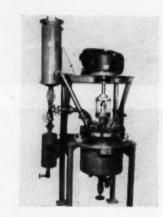
Efficient mixing is done by prongs or spiders which comb the fibers. Some of the prongs are mounted around the inside of the barrel. Others are mounted on a revolving shaft running through the center of the cylinder. This shaft rotates at 3 to 5 times the speed of the mixer cylinder. Mixing time varies from 5 to 30 min.—Paul O. Abbe, Little Falls, N. J.

High Pressure Squeeze Developed by Filter

If you have a filtering job that calls for maximum dryness or purity of cake you may be interested in the Carver hydraulic filter press. Developed originally for the food industry it now is generating interest in chemical process circles.

Initial operating step is similar to a conventional filter press. Material is pumped into the press through a feed manifold. Filtration is performed at pressures up to several hundred pounds per sq. in. Cakes thus formed then are pressed hydraulically using pressures as high as 6,000 psi. Compressed cakes are automatically rejected onto a conveyor. Press then closes and operating cycle is repeated.

Presses are furnished in various sizes for semi-plant and production requirements. They are supplied as complete installations including material feed and hydraulic pumping systems. — Fred S. Carver, Inc., 1 Chatham Rd., Summit, N. J.



New Pilot Kettles Aid Resin Study

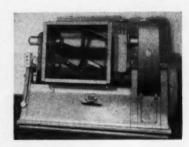
Two new pilot model kettles are designed for development work on synthetic resins.

Model A-110-A can be used both for organic reactions and synthetic resin production. Made of Type 316 stainless steel the unit incorporates a 10-gal. capacity reaction kettle, primary reflux condenser, secondary tubular condenser, decanter and receiver. A variable speed agitator is provided.

Unit can be operated from vacuum to 100 psi. An alternate model with shock-resistant glass decanter operates from vacuum to 40 psi.

Pilot kettle Model C-10 is built primarily for production of phenolic resins. Constructed of stainless steel, kettle features an anchor-type agitator with variable speed, a condenser and receiver with condensing arrangement for either refluxing or withdrawing.

Built to ASME code for internal pressures up to 25 psi. it is provided with a steam jacket for pressures to 150 psi.—Brighton Copper Works, Inc., Dept. 7, 820 State St., Cincinnati 4, Ohio.



Heavy Paste Mixer Has New Design Feature

Major advances in design have been incorporated in the new Imperial mixer. Machine facilitates fast thorough dispersion mixing of heavy plastics and colors as well as sludge reclamation in paint and enamel.

A prominent feature of the new mixer is an air-sealed stuffing box. Pneumatic pressure of 4 to 10 lb. protects the product from contamination by lubricant. It also guards bearings from damage by abrasive mixture. Carbon dioxide may be used in place of air.

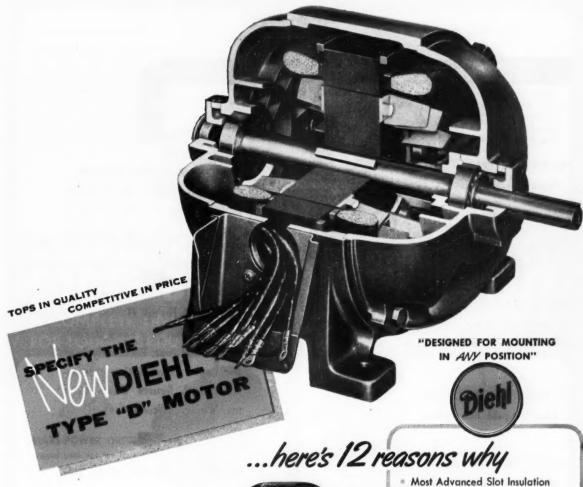
A new push-button operated dumping mechanism has been included. Optional steam jackets are designed for high pressure up to 125 lb. Standard tanks are constructed of ‡ in. sheet steel. For jacketed tanks & in. sheet is used. Tank heads are heavily ribbed cast iron.—The J. H. Day Co., Inc., Dept. 15, Harrison Ave., Cincinnati 22, Ohio.

Compact In-Line Filter Clarifies Strong Corrosives

Porous Kel-F material serves as the filter medium in a new group of compact in-line filters. Filter elements will remove from liquids all particles larger than 5 microns. On gas filtration even finer particles can be separated.

Top temperature range is 350 deg. F. Filter medium has tensile strength of 900 psi. and a modulus of elasticity of 18,000 psi.

Filter unit provides one sq. ft. of filter area in an envelope 5\frac{1}{8} in. in diameter and 6\frac{1}{2} in. long. Unit can withstand 75 psi. differential and up to 1,200 psi. line pressure. Complete filters are available from a fractional square foot surface area up to 50 sq. ft. — Porous Plastic Filter Co., Glen Cove, N. Y. (End)





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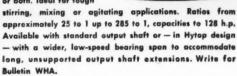
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John Callaham

Editor of CHEMICAL ENGINEERING

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He's talking about CE's "Annual Inventory Issue" coming up this Fall.

Here Editor Callaham tells you what makes it so extra special.

It's high time you got the story...

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Today, the chemical engineer is hard put to keep in step with his own progress. So many new happenings are reported in a year, he gets out of breath trying to stay on top of them. So far, he's lacked a single, all-in-one-piece sourcebook to keep him apprised of changes taking place all over the field.

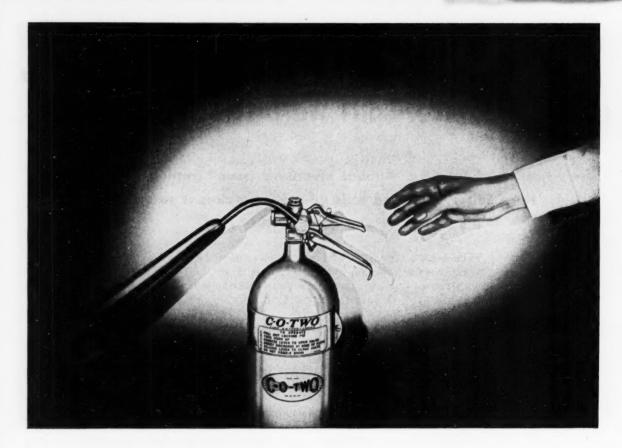
Now, you'll have it! And it'll fill a void unanswered by any other process publication — weekly, monthly or annual. For starting in 1954, CE will introduce this 'Annual Inventory Issue' as a once-a-year 'Wrap up' of CPI progress. Its purpose . . . to provide a practical, 12-month summary of significant developments that affect the chemical engineer, his job and his future in America's fastest-growing industry.

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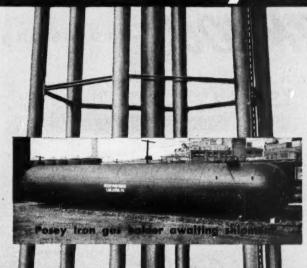
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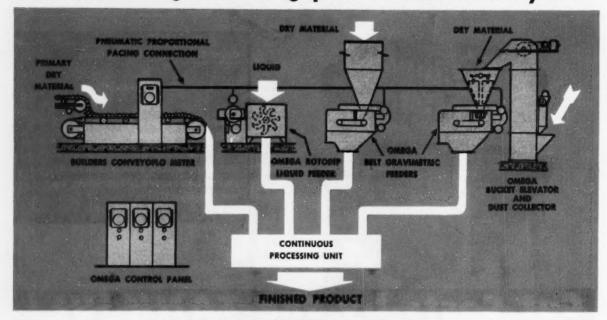


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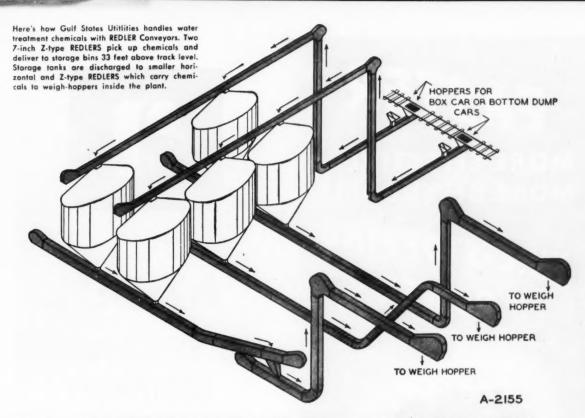
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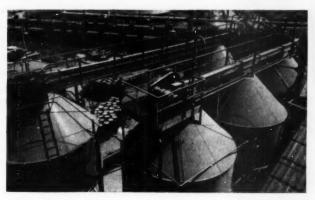




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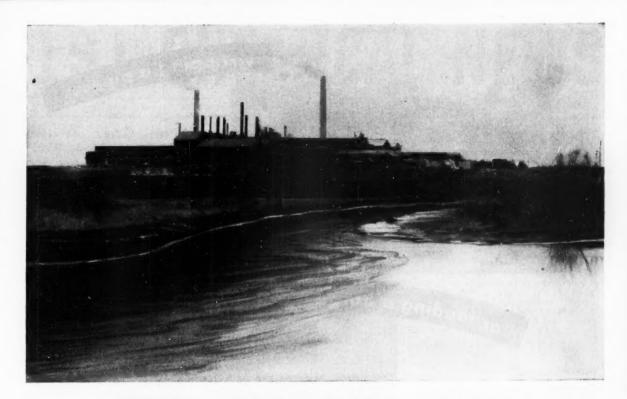
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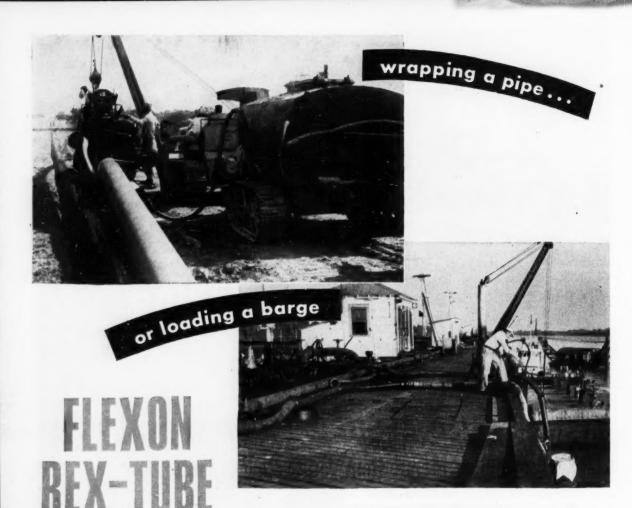
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U.S.I. CHEMICAL NEWS

A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries

Pests Do Not Develop High Resistance To Pyrethrins, Allethrin

A recent report noted that the high resistance pests develop to some insecticides disappears when the insecticide is no longer used. However, about 12 generations of non-exposure to the insecticide must pass for pests to lose their resistance. Even then, it was indicated, the number of generations of effectiveness is likely to be less than before. Pyrethrins and allethrin were named as in-

Pyrethrins and allethrin were named as insecticides against which pests have not been able to develop much resistance. In October 1952, U.S.I. completed the nation's first fullscale plant for the commercial synthesis of allethrin. U.S.I. combinations of pyrethrins and piperonyl butoxide are well known under the trade name Pyrenone. Thoroughly tested formulations containing allethrin and Pyrenone, as well as the chemicals themselves, are available from U.S.I. to industry.

New Electronic Camera Takes High-Speed Pictures

A new camera reportedly can take a picture in only one tenth of one millionth of one second. Its speed is said to be so great that it can photographically chop a beam of light into separate segments. The shutter is described as a Kerr cell consisting of two screens of polarized material separated by a solution of nitrobenzene. An electronic device applies a high electrical potential across the cell. The shutter holds out light until the electrical charge realigns the molecules of nitrobenzene, thus permitting light to pass through the cell onto the film.

According to the manufacturer there are no moving parts and the electrical power needed to take the picture is no greater than that required to light a Christmas tree bulb. The new camera promises to have a number of uses in the study of industrial processes, such as the observation of jet engine combustion.

Continuous Separation In New-Type Dry Classifier

A new type of dry classifier which continuously separates coarse and fine air-borne particles has been announced. According to the manufacturer it can be used in a closed circuit with a pulverizing mill, or as a self-contained sizing unit for any moving stream of six solids mixture.

of air-solids mixture.

The classifier is described as basically an inverted, truncated-cone shell with a motor-driven, bladed rotor revolving on a vertical center axis inside the outer shell. The raw mixture of coarse and fine air-borne material is fed in from the bottom of the cone, passes upward in the annular space occupied by the whirling blades, describes a circular motion above the rotor, and discharges through a central opening in the top. Oversize particles are removed by the impact of the blades or drop out in the eddy-current above the rotor.

Cotton Growers Cut Cost Of Weeding as Much as 50% With CIPC Formulations

Show Excellent Promise for Soybeans, Legumes, Vegetables and Other Crops

Striking accounts of the savings in labor costs through the use of CIPC herbicides have been published recently. For example, one cotton grower's

Leading Ag Colleges Find Riboflavin Levels Too Low

Reports from leading agricultural colleges indicate that previously recommended riboflavin levels in animal feeds are too low for optimum growth and feed efficiency. Many experiment station authorities are increasing their recommendations for riboflavin additions to several times more than those of the National Research Council. Levels of supplemental riboflavin as high as 6 to 9 grams per ton of finished feed are often recommended.

U.S.I. offers a wide choice of riboflavin products derived from natural fermentation sources to meet the needs of the feed industry.

Antifoam Spray Is Aerosol-Packaged

Designed for foam control in the laboratory, pilot plant or other small scale processing, a new antifoam spray is said to combine rapid speed with maximum effectiveness. The spray is an aerosol-packaged dispersion of silicone compound in freon. It blankets foam with a cloud of finely divided particles of silicone. In most cases, the manufacturer states, no trace of silicone can be detected in the finished batch after defoaming. Effective concentrations of silicone are reported usually to range from 0.01 to 1.0 part per million, which is less than the 10 p.p.m. the Food and Drug Administration allows. The freon propellent vaporizes upon discharge.

Masking Tape Withstands Temperatures up to 375° F.

Masking tape designed for use in oven temperatures up to 325°F. is now available in ½ to 36-inch widths, according to a recent report. Laboratory and field tests indicate that the tape can be used in temperatures as high as 375°F. The new tape is said to remove cleanly from treated metal surfaces, leaving no adhesive deposit and to be capable of withstanding much longer bake cycles.

It is thought that aircraft assembly, engine and parts manufacturers will be able to use the new tape for high-heat masking on treated metals such as anodized aluminum, pickeled steel and dichromated magnesium. Electronics manufacturers, among others in the metal finishing trade, should have need for the pressure-sensitive masking tape.

labor costs through the use of CIPC.

ly. For example, one cotton grower's hoeing costs were reduced from approximately \$12.00 to \$0.50 an acre in an area treated with 3 pounds of CIPC per acre. Chemical weed control costs under these conditions are reasonably constant at \$5.00 to \$6.00 an acre, indicating a saving of about \$6.00 an acre.



Hoeing costs to control weeds are about \$12.00 an acre in cotton fields like this.

According to the National Cotton Council, a substantial part of the cost of producing cotton is that of weed control — which previously has been done largely by hand hoeing. Today, however, the average cotton grower is faced with a steadily shrinking labor force and the necessity of paying higher wages. His labor costs are unpredictable, and any means of reducing them and saving money is an economic necessity. If for no other reason than this, more and more cotton growers are using CIPC weed control formulations.

CIPC formulations have been reported equal or superior to the best known commercial herbicides for cotton weed control. Two things assure their increasing use in this field: the fact that CIPC gives highly satisfactory weed control, and repeated demonstrations showing that it is the safest compound available.

Many Promising Uses
CIPC formulations are usually applied to
the soil after planting but before the emergence of the crop
plant. Although CIPC first

U.S.I. CHEMICAL NEWS

CONTINUED

CIPC Cuts **Weeding Costs**

gained recognition for the control of weeds in cotton growing, it has excellent poten-tialities for the control of weeds in soybeans, sugar beets, certain legumes, vegetable crops,



Weed central results after application of CIPC at the rate of two pounds per acre. No manual weeding has been required. Plants are, bottom to top, green beans, com, peanuts, soybeans

strawberries, ornamentals and nursery stock. CIPC also has been used to control weedy grasses in fence rows, along roadways, in fire lanes, in perennial grass seed crops and in other miscellaneous crops.

Ten to Twenty Year Life For New Storage Battery

A new type of storage battery with a life expectancy of ten to twenty years has been announced as available to manufacturers for testing and appraisal. It is claimed that while the initial cost of the battery is two to five times as much as the conventional type, it lasts so much longer that the actual cost is perhaps half as much.

The new battery uses nickel cadmium cells of a special sintered plate type in place of lead. Reported to be unaffected by shock and vibration, and to eliminate the worry of overcharging, reverse charging or short circuiting, it contains an alkaline solution instead of acid and will operate at temperatures as low as 65 degrees below zero or as high as 165 degrees Fahrenheit.

It is "extremely effective" in keeping stored potatoes from sprouting, and recently published results indicate CIPC shows unusual promise for fruit thinning of peaches. There is every indication that the already large number of uses for CIPC formulations will expand in the future.

U.S.I. produces CIPC as a 70 per cent solution concentrate in xylene, from which formulators usually prepare ready-to-use herbicides containing 4 pounds of CIPC per gallon by adding emulsifiers and additional solvent.

The amount of CIPC used per acre will vary from 1 to 8 pounds. This depends on the crop and type of weed involved and on the type of soil. In general, as the soil changes from a light sandy loam to a heavy loam the amount of CIPC required for weed control will increase. CIPC is used under a wide variety of climatic and agronomic conditions, and there are, of course, variations in performance. Therefore, local authorities should be con-sulted for recommendations on its use.

Technical data on CIPC and IPC, another U.S.I. weed controller, are available upon request. The latest CIPC bulletin lists more than 70 helpful references.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

Stopcock grease for high vacuum use is available in three grades. The grease reportedly provides proper viscosity for temperatures from 60° to 110° P., shows very low hydrocarbon absorption, and permits pumpdown in vacuum systems.

(No. 1010) Fire-resistant translucent fiberglass panels de-signed for critical fire areas are claimed to ofter adequate color stability. Uses include struc-tural and decorative applications. (No. 1011)

A new flash-point tester is electrically-heated. A 150-watt heater and variable-power transformer with reproducible setting are reported to supply the close heat control needed by the ASTM D-56 test. (No. 1012)

A new paper making process uses 40% of cheap poplar wood, according to a recent report. Previously only 10 per cent of poplar has been successfully used, it was stated. In addition to special pulp grinding methods, a new chemical process was used. (No. 1013)

A new coal additive, described as simple to use, is said to reduce heating costs, do away with hard clinkers, eliminate odors and soot, and enable a banked fire to start up instantly. (No. 1014)

A copper plating process reportedly produces mirror brightness, avoids pitting of the cathode and holds brightners breakdown to a minimum. According to the developers of the process, increases plating production up to 60%. (No. 1915)

For measuring fast pressure changes at temperatures as high as 5000° F., a new pressure pick-up is little larger than a cigarette. The instrument component is said to dispose of heat at a rate of 11 BTU's a second over each square inch of its surface.

(No. 1016)

its surface. (No. 1016)

A new detergent for dry cleaning systems is said to increase the removal of water-soluble stains and to eliminate shrinkage, breaking and water stain. The detergent permits the use of larger amounts of moisture. (No. 1017)

Organosodium compounds and their derivatives can now be made economically, using finely dispersed sodium. A new booklet describes easy preparation methods using simple mixing procedures. Yields are said to be high, and reaction rates easy to control. (No. 1018)

A new microfilmer has been announced as offering five different reduction ratios and a choice of either 16 mm. or 35 mm. film. According to the manufacturer it provides a choice of three accepted methods of microfilming: standard, duo and duplex. (Ro. 1019)

PRODUCTS OF U.S.1.

ALCOHOLS

Amyl Alcohol (Isoamyl Alcohol) Butanol (Normal-Butyl Alcohol) Fusel Oil — Refined Propanol (Normal-Propyl Alcohol)

Ethanol (Ethyl Alcohol) manel IETNYI Alcehell
Specially Denatured—all regular
and enhydraus formulas
Cempletely Denatured—all regular
and enhydrous formulas
Pure—190 proof U.S.P.,
Absolute—200 Proof
Solax—arparistary salvant

regular and anhydrous

ANTI-FREEZE Super Pyro* Anti-Freeze U.S.I. Permonent Anti-Freeze

Ethyl Ether, U.S.P. Ethyl Ether, Absolute-A.C.S.

ACETONE-A.C.S.

ANSOLS ACETIC ESTERS

Amyl Acetate—C Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate OXALIC ESTERS

Dibutyl Oxalate Diethyl Oxalate PHTHALIC ESTERS Diamyi Phthalate Dibutyi Phthalate Diethyi Phthalate

OTHER ESTERS Diatel* Diethyl Cerbonate Ethyl Chlereforma RESINS (Synthetic and Natural)
Arocham*—modified types
Arofene*—more phenolics
Aroflat*—for special flat finishes
Aroflat*—ream temperature
curing phenolic
Aroplat*—olikyds and allied materials
Aroplat*—capalymer modified alkyds
Ester Gum—all types
Natural Resins—all standard grades

INSECTICIDE MATERIALS

Allethrin
CPR Concentrates: Liquid & Dest
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Preducts: Liquid and Dust
Retenene Products: Liquid and Dust

INSECTIFUGE MATERIALS Indolone* Triple-Mix Repellents

INTERMEDIATES

Acetoacetanilide Acetoacet-ortho-chloroanilide Acetoacet-ortho-toluidide Acetoacet-para-chioranilide
Ethyl Acetoacetate
Ethyl Benzoylacetate
Ethyl Sodium Oxalacetate
FHED FRODUCTS

TED PRODUCTS
Calcium Pantathenate (Feed Grade)
Choline Chloride
Curboy B.G* 80
D._Methionine (Feed Grade)
Niacin, U.S.P.
Riboflavin Concentrates
Special Liquid Curbay*
U.S.I. Vitamin B₁₂ and
Antibletic Feed Supplements
Vacatone* 40
OTHER PRODUCTS

OTHER PRODUCTS

Acetaldehyde
Caustic Sada
Ethylone
IPC (Isopropyl-NPhenyl Carbamate)
CIPC
Liquid Chlorine

Metallic Sodium
Methionine (Pharm.)
N-Acetyl pL.Methionine
Nitrocellulose Solns.
Propionaldehyde
Propionic Acid Sulfuric Acid Urethan, U.S.P. *Reg. U.S. Pat. Off.

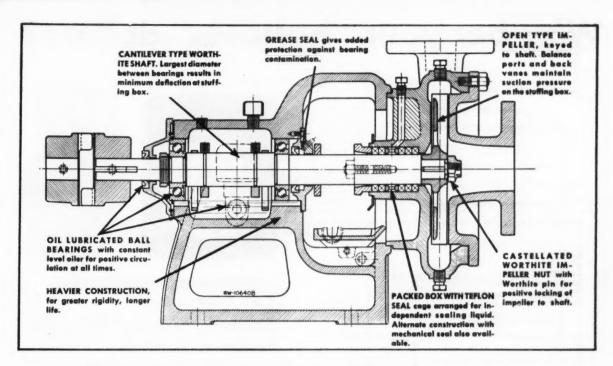
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Division of National Distillers Products Corporation

120 BROADWAY, NEW YORK 5, N. Y.

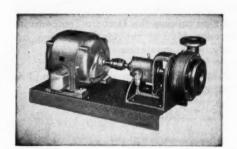
BRANCHES IN ALL PRINCIPAL CITIES

CHEMICALS



New features make Worthington's corrosion-resistant pumps better than ever

Worthington also increases size and capacity range of Worthite pumps, standardized with packed box or with Worthington mechanical seal



THE NEW CNG WORTHITE PUMP comes in 21 sizes, 3/4" to 6", up to 2000 gpm. Heads up to 200 feet. Write for our new Bulletin W-350-B14 to Worthington Corporation, Centrifugal Pump Division, Harrison, New Jersey.



CENTRIFUGAL STOCK PUMPS
Type PP. Handle all kinds of stock
up to 6½% consistency. 6 sizes.
Connection up to 6000 gpm; heads
and 104 feet.



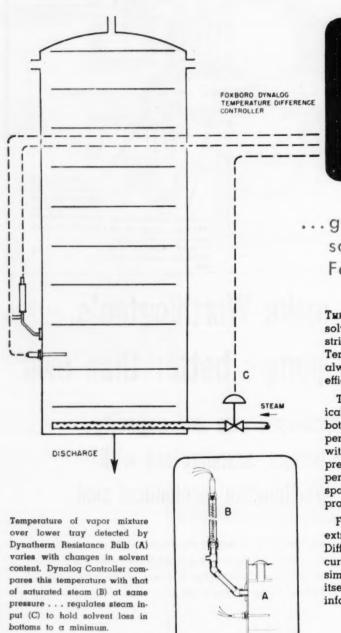
GENERAL PURPOSE PUMPS Type CN. Single stage. Sizes % in. to 6 in. Capacities up to 2400 gpm; heads to 390 ft.



BOILER FEED PUMPS Capacities up to 2000 gpm; pre sures to 1250 psi.



Why bet your "bottoms" dollars?



...get maximum
solvent recovery through
Foxboro Control

THERE'S NO NEED TO RISK loss of valuable solvent or possible river pollution through stripper column discharge. With a Dynalog Temperature Difference Controller you can always be certain of highest extraction efficiency.

This highly sensitive Controller automatically measures volatile content of stripper bottoms to within 0.02% by comparing temperature of mixed vapors in lower column with saturated steam temperature at same pressure. Then, on the basis of a pre-set temperature difference value, it regulates flow of sparging steam or column input to maintain proper balance.

For measurement and control of any steam extraction process the Foxboro Temperature Difference Method provides maximum accuracy with minimum maintenance. It's simple to install and will quickly pay for itself in greater yields. Write for complete information,

THE FOXBORD COMPANY, 363 NEPONSET AVÉ., FOXBORO, MASS., U. S. A.



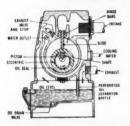
DYNALOG ELECTRONIC CONTROL

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

Cut Costs... Boost Efficiency...with Stokes High Vacuum Pumps



At left is the new Model G Stokes High Vacuum Pump. Basically, and in outward appearance, the new model is the same simple, efficient, compact and reliable unit as its widely used predecessor, Model F. Five major engineering impravements are incorporated in the new model: 1) a new mechanical face-seal minimizes routine maintenance and reduces to a minimum the possibility of oil leakage at the shaft; 2) new exhaust valve-stops permit use of these pumps in an exceptionally broad range of applications, including rapid cycling evacuation of large-volume systems; 3) a new intoke screen filter prevents damage by dirt, scale, and other solids sometimes present in the system; 4) a new oil filter in the line to the shaft seal affords special protection to the bearings at these points; 5) a new solenoid valve in the oil supply line automatically prevents oil-flooding of the pump in the event of power failure.



The operating principles of the Stokes High Vacuum Pump are simple. Rotation of the Stokes Pump is indicated in cross-section view at left: Air enters the increasing space at right of piston, while air trapped in the decreasing space at left of piston is compressed. As piston nears top of stroke, pressure of the trapped air opens the feather-type discharge valve against atmospheric pressure, and the air is forced out of the cylinder. As piston passes through its top position, the suction port is momentarily closed by piston. Air then present in cylinder is trapped, a new cycle begins.



A completely revised brochure on Stokes High Vacuum Pumps is now available, free, upon request. It explains, and shows, how Stokes Pumps combine simplicity of design, high volumetric efficiency and lowest operating costs to provide reliable, continuous service for all kinds of high vacuum pracessing equipment. Examples of typical vacuum systems using Stokes Pumps are cited and typical problems in pump selection and their solution are provided. Also described is the complete line of Stokes High Vacuum Processing Equipment and the new Stokes Experimental and Applications Laboratory in Philadelphia, Penna.



The new Stokes Vacuum Calculator for rapid slide-rule vacuum calculations, including a standard ABCD log scale, is now available, free, upon request. It has proved to be of tremendous value those engaged in vacuum research and processing. Simplifies determination of pump capacity required for given valume in given time or given valume in given time or given valume to specified vacuum with user's present equipment. Numerous tables on reverse face provide useful vacuum reference data.



Send for copy of a new handbook "How to Care for Your Vacuum Pump." (Bulletin No. 755). Contains many valuable suggestions abous installation, starting, servicing, trouble-shooting; and helpful "Do's" and "Don'ts" on vacuum pumps and vacuum pumping systems.

Simplicity and sturdy construction, accessibility, high volumetric efficiency, low power consumption, and effective cooling are distinctive features of Stokes High Vacuum Pumps.

Better blank-off pressures and quieter operation are assured with a completely new, longer lasting exhaust valve assembly. Intake ports are open during the entire intake cycle; there is no slide-valve shut-off.

Lubrication is completely automatic. There are no oil shut-off valves and adjustments. Horizontal vacuum intake permits trapping of harmful dirt and scale. Vacuum-tight rotary seals eliminate the need for shaft packing and constant adjustment. Easy access is provided to the valve assembly and other parts requiring periodic examination.

Stokes High Vacuum Pumps are available in capacities from 15 to 500 cfm. Where necessary, oil purification units — to assure continuous supply of clean, water-free oil — can also be furnished.

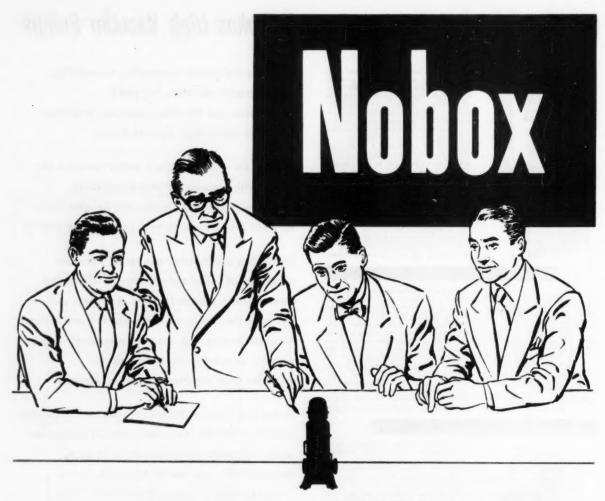
Wherever hard, continuous service is required to meet today's exacting high vacuum requirements, Stokes High Vacuum Pumps prove a profitable investment.

Consult with Stokes on the application of vacuum to drying, freeze-drying, impregnation, extraction, solvent recovery, evaporation, vacuum metallizing, and to other purposes for which vacuum deserves exploration.

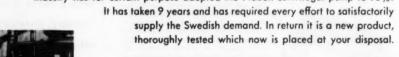
F. J. STOKES MACHINE COMPANY PHILADELPHIA 20, PA.

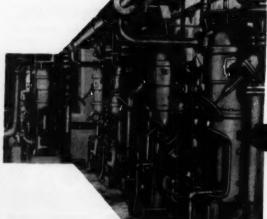


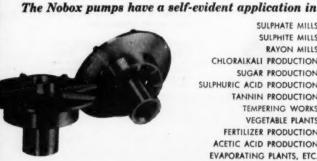
STOKES MAKES: High Vacuum Equipment, Vacuum Pumps and Gages/Industrial Tabletting, Powder Metal and Plastics Molding Presses/Pharmaceutical Equipment



A vital operating problem for the chemical industries has now self-evidently been solved. The Nobox centrifugal pumps have created a shaft seal of such revolutionizing type that liquids of all kinds can be carried without risk for delays in operation on account of leaks and re-packings frequently recurring. The pump is not restricted from other possibilities of application due to its design. The Nobox pump will operate with equal reliability at positive pressure and vacuum within very great temperature and pressure limits. The world-famous Swedish cellulose industry has for certain purpose adopted the Nobox centrifugal pump to 96%. It has taken 9 years and has required every effort to satisfactorily





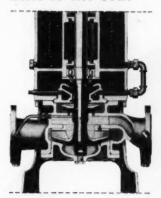


SULPHATE MILLS SULPHITE MILLS RAYON MILLS CHLORALKALI PRODUCTION SUGAR PRODUCTION SULPHURIC ACID PRODUCTION TANNIN PRODUCTION TEMPERING WORKS VEGETABLE PLANTS FERTILIZER PRODUCTION ACETIC ACID PRODUCTION EVAPORATING PLANTS, ETC.

The Centrifugal Pump

entirely without Packing boxes

This is the seal



The liquid lock wheel is the major part of the design and the sealing action, located at the suction side, occurs entirely hydro-dynamically. The upper vane ring of the wheel creates a liquid ring on rotation, which will seal against positive pressure and infiltration. The lower side of the vanes prevents air from coming in, when the same pump is operating at vacuum or suction height. By proper balancing of the ratio between the diameters of the upper and lower vane ring, power consumption is reduced to a minimum. When the pump is out of operation, sealing is accomplished by a disc valve, which, however, during operation is completely disconnected and consequently is not subjected to any wear.

This is the performance

Nobox is the only pump entirely without packing boxes that has the sealing located at the suction side. That is why the upper limit of its efficiency can be set so high. With respect to capacity and pressure height the Nobox is designed in three major series.

- Z30 radially divided one-wheel pumps
- Z32 axially divided one-wheel pumps provided with pump wheel of two-side suction
- Z33 axially divided two-wheel pumps with pump wheels operating in series

The table shows the application of the various types. The parts coming into contact with the liquid pumped are made from a number of various materials including cast iron, stainless or acidproof steel and hard lead and hard rubber. The Nobox is very strongly designed. The vertical assembly of the pump makes it easy to install, saving a lot of floor space and providing effective protection for bearings and motor.

			PRESSURE ON S	UCTION FLANGE
SERIES	MAX. CAPACITY U.S. G.P.M.	MAX, HEAD Feet	MAX. POSITIVE PRESSURE p.s.i.g.	MAX. VACUUM Inches Hg.
Z30	610	250	50	24
Z32	2600	165	42	24
Z33	130	500	45	24



To the employees engaged in the chemical industry, who know all about the enormous difficulties involved in carrying corroding and eroding liquids, the qualities of the Nobox centrifugal pumps will mean an entirely new basic point from which to plan the operation. We should be glad to mail detailed information and also would appreciate it if a personal call by our representative could be arranged.

JÖNKÖPINGS MEKANISKA WERKSTADS AKTIEBOLAG

JÖNKÖPING . SWEDEN

FREE-FLOWING FOR YEARS

... because it's CHASE® COPPER WATER TUBE





Chase Copper Tube keeps a clean, clear cross-section, even after years of service in a paper mill.



Get pipe that can't rust up inside. Chase Copper Water Tube keeps repair and pumping costs down. **PROCESS LINES** give years of troublefree service when you use Chase Copper Water Tube.

Chase Tube is corrosion-resistant, it can't clog with rust. Used for your process lines, it delivers full flow even for heavy industrial fluids like paper pulp. That means a big saving in pumping costs.

Chase Copper Water Tube installed with Chase Wrought Solder-Joint Fittings makes an assembly that has very low flow resistance. It will pay you to find out about Chase Copper Water Tube.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT . SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany† Atlanta Baltimore Besten

Ballat Derroit Bouston Informanis ngeles ukee apolis k York San Francischer Santin Waterbury



Here's SK's NEWEST DESIGN for Rate-of-Flow Measurement—the SAFEGUARD ROTAMETER

As an answer to industry's increasing demands for safety and convenience in rate-of-flow measurement of liquids and gases, SK has designed its newest Rotameter—the Safeguard Rotameter.

This Rotameter has specific application for measurement in the higher temperatures and pressures of modern process technology, or where dangerous or valuable liquids and gases are being used.

FOR SAFETY:

The completely enclosed steel meter case has detachable safety glass windows, protects the metering tube from external shock, and also protects the operator if accidental tube breakage occurs.

FOR CONVENIENCE:

Wider front and rear sight glass windows give maximum visibility. The detachable metal reference scale can be supplied in either units of flow or in millimeters for use with calibration charts, as desired.

Extreme construction rigidity gives precise end fitting alignment, eliminates pipe stresses on the tube.

Can be adapted for remote recording and controlling of fluid rate of flow

Write for full information, including sizes and capacities, on this newest Rotameter design.

District of the state of the st

Glass motoring tube has cylindrical inlet and outlet pieces of the same outside diameter — allowing use of the same size packing rings on either end of the tube.

Horizontal inlet and autlet can be connected in four different positions.

Two types of metal mandrel made tubes are available—the "HCF," a High Capacity Fluted tube, or the "R," a conical tapered tube without flutes.

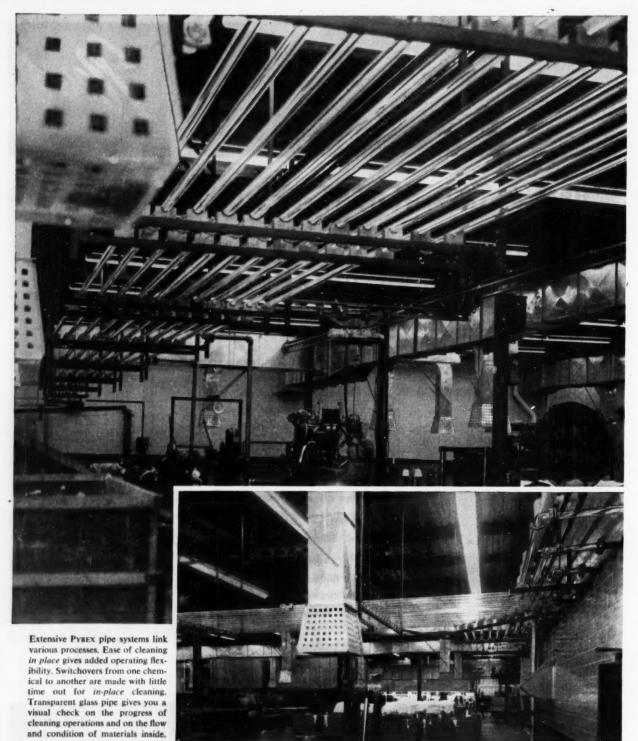
Various rotor designs and materials permit wide capacity range within one mater.

End fittings are available in cast iron, bronze, and stainless steel.

Neoprene packing gives corresion resistance, tight seal, long service life. Other packing material is available.

Rotor removal and tube cleaning without dismontling easily done through non-leaking seated cleanout plug.





The Pyrex pipe shown is part of the American Thread Company's dye handling installation at Sevier, N. C. Glass pipe won't react with the sensitive materials transferred in it. It eliminates the threat of product contamination.

American Thread finds PYREX® pipe safest for handling sensitive chemicals

At the American Thread Company's plant in Sevier, N. C., PYREX brand "Double-Tough" glass pipe handles textile dyes with complete safety.

Like many other fine chemicals and pharmaceutical products, textile dyes are extremely sensitive to metallic contamination. Pyrex brand glass pipe eliminates this threat completely. The extreme chemical stability of Pyrex brand glass No. 7740 also makes it the most corrosionresistant of all piping materials. You can handle all acids or acidic solutions (except HF) safely in PYREX pipe.

No take-down for cleaning

American Thread Company also obtains wide operating flexibility with PYREX pipe. Quickly cleaned in place, the same lines can be used for incompatible materials with little

time out for changeover. And you can be sure glass pipe is clean because its transparency lets you see.

Transparency helps you in other ways, too. You can spot impediments and air locks in Pyrex pipe. You can catch trouble before damage occurs. You have instant visual inspection of flow anywhere in the pipe at any time.

Economy

Won't contaminate . . . won't corrode . . . easy to clean . . . transparent; how about its economy?

The initial cost of glass pipe compares favorably with pipes of other kinds. Once installed the cost of maintenance is negligible and replacement due to wear or breakage is rare.

Our engineers calculate that PYREX pipe continuously carrying 5% hydrochloric acid at 212° F. loses only .0003 inch of thickness a year. At this rate it would take over 200 years to eat away 30% of a quarter-inch wall thickness.

Pyrex brand glass pipe is actually the most economical corrosion-resistant piping material you can use

How to get detailed information

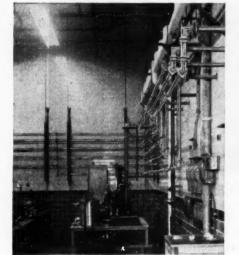
It's easy for you to find out how Pyrex pipe might help you solve materials-handling difficulties arising from corrosion or product contamination. It will cost you nothing to draw on the experience of the nearest Corning distributor listed below. For additional information or prompt service, write, wire or phone him. Or, mail the coupon below to us at Corning to receive free detailed literature.

Distributors of Pyrex brand "Double-Tough" Glass Pipe

BELMONT, CALIFORNIA FRESNO 17, CALIFORNIA NEW HAVEN, CONNECTICUT ATLANTA, GEORGIA CHICAGO 44, ILLINOIS Fred S. Hickey, Inc. NEW ORLEANS, LOUISIANA W. H. Curtin & Company

CAMBRIDGE 39, MASS. Macalaster Bicknell Compo ST. LOUIS 4, MISSOURI LODI, NEW JERSEY ALBANY 5, NEW YORK A. J. Eckert Industrial Sales Corporation BUFFALO 13, NEW YORK ROCHESTER 3, NEW YORK HATBORO, PA. Sentinel Glass Company

PITTSBURGH 19, PA. Fisher Scientific Compa HOUSTON 7, TEXAS W. H. Curtin & Company SEATTLE 4, WASHINGTON TORONTO, ONTARIO, CANADA Fisher Scientific Company, Ltd. MONTREAL 3, QUEBEC, CANADA Fisher Scientific Company, Ltd. VANCOUVER, B. C., CANADA



Pyrex brand glass pipe is easy to install. Your own workmen can handle the complete installation. A compact Field Installation Kit you can obtain from Corning, makes glass pipe plumbing a simple operation.

OX.
*

CORNING GLASS WORKS

CORNING, N. Y.

Corning means research in Glass

COMMING OFWER MO	RKS, 13 Crystal St., Corning, N. Y.
Please send me the material	checked below:
"PYREX brand 'Double-To	ugh' Glass Pipe and Fittings Catalog" (EA-3)
☐ "PYREX brand Glass Pipe	in the Process Industries" (EA-1)
☐ Installation Manual on PY	REX brand "Double-Tough" Glass Pipe
Name	Tille
Company	

Why Automatic Batch Operations

HYDRAULIC PRESS OPERATION

BATCH CHARGING AND DUMPING

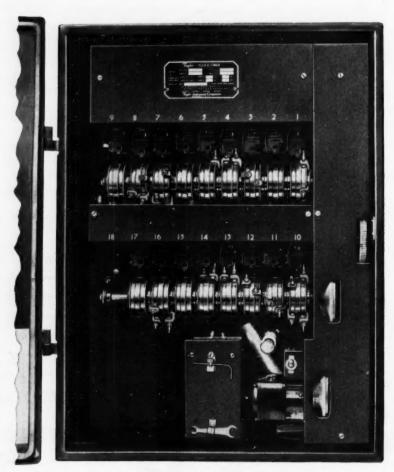
PLASTIC MOLDING OPERATIONS

HYDROGENATION OF EDIBLE OILS AND FATS

DRY ICE MOLDING

BACKWASHING OF CATALYST AND FILTER BEDS

RUBBER VULCANIZING



The Taylor FLEX-O-TIMER Time Cycle Controller

Made in five different models, for applications requiring from one to thirty-six pneumatic or electric operations or any combination of the two. Available with either fixed or adjustable speed drives. Control functions are accomplished by pneumatic valves and electric switches, connected mechanically to latch-operators. These operators are set in motion by actuating pins located on a specially designed cycle drum, driven by a synchronous motor through a gear train and set to complete one revolution each cycle or time period.

Sequencing of \$AVE\$ DOLLAR\$...

...because the Taylor FLEX-O-TIMER® Time Cycle Controller "does its own thinking"—takes care of as many as 36 operations automatically, thus saving operator man hours!

THIS dividend-paying instrument is the Taylor FLEX-O-TIMER Time Cycle Controller. It provides precise, automatic timing of the sequence and duration of processing operations involving temperature, pressure, mechanical motion, electrical energy or combinations of each. It does this precisely in accordance with predetermined schedule. And merely pushing a button sets this controller in operation to sequence all of the required process functions. There are hundreds of applications throughout industry where this versatile controller can insure greater uniformity of processing, save operator effort—both physical and mental—and save you money. If you say "yes" to any of these questions it will pay you to call in your Taylor Field Engineer now.

Q. Do you have batch processes requiring personnel to perform multiple operations in sequence with complete reliability?

A. The Taylor FLEX-O-TIMER Controller enables you to coordinate batch processes to meet the requirements of a continuous process. You don't have to rely on people to turn the valves or perform other operations at the right time. (e.g., the regeneration of a contaminated catalyst bed in a continuous process. The FLEX-O-TIMER Controller will:—stop the process; clean out process fluids; backwash the bed—or burn out the impurities; put the unit back on stream. All this automatically and in accordance with the best practices.)

Q. Are you faced with reprocessing and consequent costly waste if certain manual operations do not take place at the right time, in the right sequence and for the correct duration?

A. You eliminate the possibility of human error with this robot brain in control. You can depend on the FLEX-O-TIMER Controller to turn the valve, pull the switch or perform other operations—automatically. (e.g., the molding of plastics or vulcanizing of golf balls.)

Q. Can customer dissatisfaction ever be traced to variations in product quality due to processing irregularities?

A. Once you've developed the optimum time, temperature, pressure and other variables for a process you can

be sure of repeating that process *exactly*, time after time. Result: You are assured of a uniformly high quality product—the secret of repeat business. (e.g., backwashing of filter beds in a continuous process.)

Q. Wouldn't you consider it a good investment if a completely automatic sequencing control system applied to your batch processes paid off in a year or less?

A. Many chemical plants have increased their profits by revamping their batch processes in this way, using the Taylor FLEX-O-TIMER Controller as the key instrument. (e.g., the operation of hydraulic presses in removing excess chemicals from fibrous materials; plastic press operation; dry ice molding; the lamination of plywoods; tire molding; the opening and closing of dump valves in paper pulp bleach cells; the batch hydrogenation of edible oils and fats.)

Q. Why is this system so successful?

A. Because Taylor Instrument Companies have the necessary experience and know-how to apply instrumentation of this kind to the best advantage in many diversified industries. Taylor Engineers have acquired this skill through many years of working in the field with instrument men and engineers. Their knowledge is at your disposal. Why not write today! Also ask for Bulletin 98154. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Taylor Instruments

—— MEAN ———
ACCURACY FIRST

IN HOME AND INDUSTRY

for either of these
CHEMICAL PUMPING
needs...specify

AUTOMATICALLY CONTROLLED DELIVERY

MEDIUM to HIGH PRESSURE SERVICE

FOR AUTOMATICALLY CONTROLLED DELIVERY use an Aldrich-Groff "POWR-SAVR." This variable stroke triplex pump controls delivery from 0 to 100% of capacity at constant pump and motor speed... can be controlled from any remote point, manually or automatically. Power requirements are low, because consumption is directly proportional to demand.

"POWR-SAVR" pumps handle any free-flowing liquid at discharge pressures from 300 to 15,000 psi and are available in six sizes—from 2" to 6" stroke and from 5 to 125 bhp. For more information on these versatile pumps, write for Data Sheet 65.

FOR MEDIUM TO HIGH PRESSURE SERVICE several types of constant stroke pumps are available—depending upon the service involved. You may need the Inverted Vertical Triplex (Data Sheet 66), the Vertical Triplex (Data Sheet 26), or the Direct Flow Triplex or Multiplex Pump (Data Sheets 64, 64B). (All these helpful data sheets are available upon request.)

From our experience in building pumps for the chemical industry, we can—from our engineering and service files—frequently make specific recommendations to meet your chemical pumping needs. Whatever your problem, we welcome your inquiries.

Aldrich Pumps are ideal for applications involving corrector, abrasive materials, high viscosity or high pressure. Among many liquids handled by Aldrich Pumps are: caustic solutions, fatty acids, nitric acid, acetic acid, aqua ammonia, anhydrous ammonia, as well as liquids encountered in the petroleum refining, petroleum chemical, and other industries.



This Aldrich Vertical Triplex Pump—on the job at the Burlington, N. J., plant of Hercules Powder Company—is employed to pump rosin ester in the manufacture of Abitol, hydroabietyl alcohol, used in lubricants and in the manufacture of alkyd resins. In this application pump capacity is one gallen per minute against 6,000 pounds discharge pressure.



...Originators of the Direct Flow Pump

Representatives: Birmingham • Bolivar, N. Y. • Boston • Buffelo • Carmi, Illinois • Charleston, W. Va. • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • Duluth
Houston • Los Angeles • New York • Oakland, Calif. • Philadelphia • Pittsburgh • Portland, Ore. • Richmond, Va. • Rochester • Salt Lake City • San Francisco • Seattle
Somerville, Mass. • Spokane, Wash. • Syracuse • Tulsa • Washington, D. C. • Youngstown • Export: Petroleum Machinery Corp., 30 Rockefeller Piaza, New York 20, N. Y.

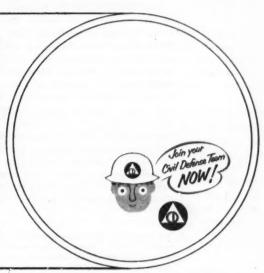




Whether you're an engineer who wants technical information in a hurry, or a new user of tubing looking for the full story of stainless and high-alloys, you'll find this booklet equally valuable.

In it, discussed by classification, you'll find data on pressure, sanitary, mechanical, heat-resistant, ornamental and other forms of stainless and high-alloy welded tubing. There are engineering data on joining methods, welding techniques, bending and installation hints. Also included are complete tables of bursting pressures, physical and chemical properties of stainless steels and other alloys, and corrosion and temperature data. This is only a partial list of contents, but it will give you an idea of the wealth of pertinent, factual information the booklet contains.

To get your free copy, just drop us a note on your company letterhead. There is no obligation, of course.

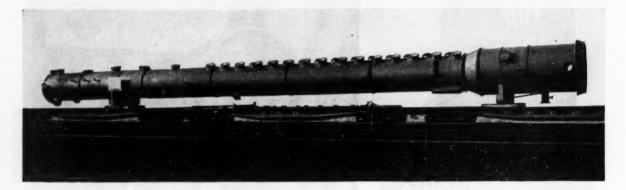




STAINLESS STEEL TUBING

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)

THIS TOWER IS 123 FEET LONG 6 to 8 FEET DIAMETER*



EVEN SO, THERE'S MORE THAN MEETS THE EYE

. . . although the size of this particular job is impressive, it's what doesn't meet the eye, that makes the difference. The important element on this or any DOWNINGTOWN job of carbon steel and alloy plate fabrication is their ability to produce quality products of Correct Design, Right Materials, with Skilled Craftsmen . . . at a Fair Price.

Let DOWNINGTOWN'S experience and research in the fabrication of various grades of Carbon Steel, Stainless Steels, Nickel-Clad, Stainless-Clad, Monel-Clad, Nickel, Aluminum, etc., be'of help to you. We are equipped with modern facilities to handle jobs, (within our limitations,) in the correct alloys and with methods of fabrication required to assure satisfactory operation. DOWNINGTOWN has a Heat Transfer Division under the direction and supervision of men thoroughly trained and experienced in this field. Engineering Consultation with them is at your service to aid you in preparation of plans and specifications for definite jobs.

Useful literature gladly sent upon request. Remember: "your Plate Fabrication or Heat Exchanger needs are our specialty!"

* This Tower 8'0" dia., large end tapering to 6'0" dia. Total length is 123'7". Tower equipped with 55 trays, each Tray fitted with 86 Riser Pipes, Bubble Caps, etc. Thickness of Shell and Head is ¾" and ¾" carbon steel, respectively.



In addition to information on manufacturing equipment, welding procedure qualifications, and typical examples of plate and heat exchanger fabrication, a partial analysis of the 1930 ASME Code for Unfired Pressure Vessels and a few comparisons with the 1949 Code are included in a bulletin which will be mailed on request. Write for your copy, today.



NEW YORK OFFICE: 30 CHURCH ST.

DOWNINGTOWN IRON WORKS, INC.

DOWNINGTOWN-PENNA.

STEEL AND ALLOY PLATE FABRICATION AND HEAT EXCHANGERS

PRESSED STEEL



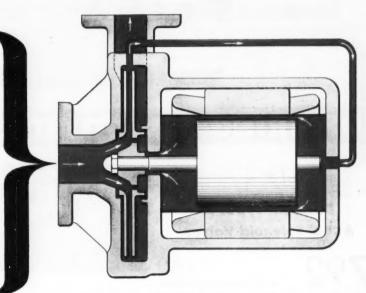


has no shaft seal or stuffing box-IT CAN'T LEAK

TYPICAL FLUIDS EASILY HANDLED BY CHEMPUMP

Hydrofluoric Acid
Nitric Acid
Formaldehyde
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fitanium Tetrachloride
Organic Solvents
Carbon Disulfide
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Here's an exciting engineering concept in pumps...one that eliminates pump maintenance problems! Think of it: no shaft seal...leak proof...no stuffing box...no lubrication... totally enclosed, motor and all! Benefits? No leakage or contamination of fluids...seals-in expensive, toxic, or corrosive fluids...protects plant and personnel.

The combined rotor and impeller assembly, actuated by a radial magnetic drive is the only moving part! Fluids circulate through the rotor chamber of the motor. The stator is isolated from the fluid by a corrosion-resistant, non-magnetic alloy cylinder. And the rotor is hermetically sealed.

Chempump is available in from ½ up to 3 horsepower; Capacity range is from 0 to 180 gallons per minute. Discharge heads from 3 to 90 feet. Materials of construction—wide selection of alloys available. Prices start at \$96 for stainless steel construction.

Write at once for more data on this "years-ahead" centrifugal pump.



Bulletin G-1000 contains complete data.

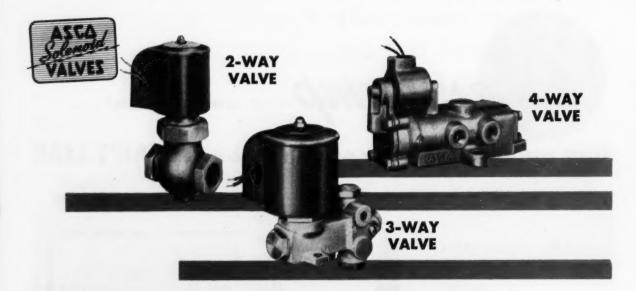
Send for your copy, today.

CHEMPUMP CORPORATION

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ENGINEERING REPRESENTATIVES IN OVER 30 PRINCIPAL CITIES IN THE UNITED STATES AND CANADA



OFFERING SELECTIVITY PLUS

1237
Different Types

Different Types of ASCA® Solenoid Valves

792...Two-Way Solenoid Valves

Sizes % to 6 inches • Temperatures to 600°F
 Pressures to 1500 psi • Fully Automatic • Manual Reset • Wide Selection of Body Materials

PLUS

385 ... Three-Way Solenoid Valves

Sizes ¼ to 6 inches • Temperatures to 450°F
 • Pressures to 1000 psi • Fully Automatic • Manual Reset • Wide Selection of Body Materials

PLUS

• Sizes ¼ to 1½ inches • Temperatures to 212°F • Pressures to 250 psi • Poppet or Slide Type • Brass or Bronze Bodies

MANY VALVES for automatically controlling the flow of liquids and gases

ASCO Solenoid Valves are available with standard, explosion-proof or water tight solenoid enclosures and Class A or Class H coils... in a wide range of body materials including stainless steel, cast iron, brass, bronze, etc.,...with all design and manufacturing backed up by some fifty years of Engineering Leadership in the Solenoid Valve Control Field.

ASCO Engineers at the plant or in key cities will be glad to work with you on your problem and to recommend the best valve, standard or special, for your requirements.

Experience Shows
"THERE'S AN ASCO VALVE
FOR EVERY PROBLEM"

Our Valve Catalog No. 24 gives complete upto-date information on the extensive line of ASCO Solenoid Valves. WRITE FOR YOUR FREE COPY TODAY!



Since 1888
Designers and
Manufacturers
of Electromagnetic
Controls.

Automatic Switch Co.

381 LAKESIDE AVENUE · ORANGE, NEW JERSEY



President George E. Wilson (right), of the G. E. Wilson Co., shows J. H. Bahlburg, Wyandotte representative, the first completed unit of his company's facilities being erected at Providence Municipal Wharves, Fields Point, R. I.

"We have enjoyed 25 years of growing with Wyandotte"

- George E. Wilson, President, G. E. Wilson Co.

The G. E. Wilson Co., Providence, R.I., was one of the pioneers in handling liquid caustic in tank cars. "Our new facilities at Providence Municipal Wharves will offer many advantages to both our customers and ourselves," says George E. Wilson, President. "In addition to advantageous incoming water shipment, we have a more convenient location and sufficient room for further expansion."

The George E. Wilson Co. has been a Wyandotte customer for more than 25 years. "We use Wyandotte Caustic and Chlorine in the manufacture of hypochlorites," Mr. Wilson says. "We also distribute them to others. We consider Wyandotte an excellent source of supply - more than once they helped us over the hump in times of short supply. Wyandotte has always been known for quality . . . since bringing in their new facilities, we are certain that no one can exceed them in quality. Today, the impurities in our finished products are infinitesimal . . . in fact, the stability and quality of our products are at an all-time high."

Do you use chemical raw materials in your processes or products? If so, let us quote you on your requirements. Remember,

Wyandotte service is helpful and far-reaching, and Wyandotte representatives are constantly working with industries like yours, to cut costs and create product improvement. Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.

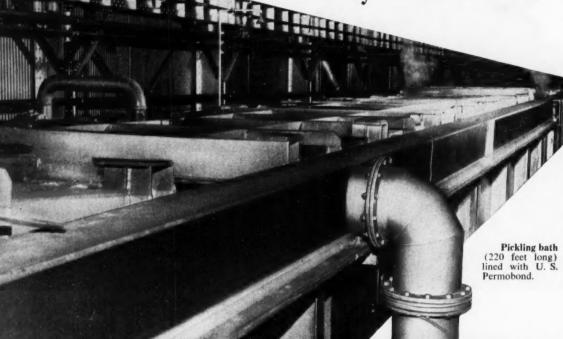


Soda Ash • Caustic Soda • Bicarbonate of Soda • Chlo-

rine • Calcium Carbonate • Calcium Chloride • Glycols Synthetic Detergents • Agricultural Insecticides • Soil Conditioners • Other Organic and Inorganic Chemicals

Steel gets pickled in bath tanks

lined by U.S. Rubber

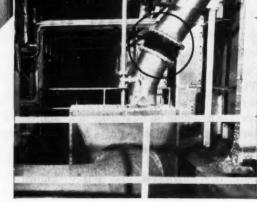


Many steel plants handle the hot corrosive acids used in pickling operations by means of tanks lined with Permobond, a product made and installed by United States Rubber Company. Without this rubber, the hot acids would "eat" and corrode the metal tanks.

Typical is this large Midwestern steel plant. The complete pickling unit, acid bath tanks and covers, rinse tanks, fume exhaust system, including a large stack, are all "Permobond-protected."

This steel plant also uses U. S. Expansion Joints to counteract expansion and contraction in pipe lines forming the duct system. And to provide flexibility, U. S. Pilot Flexible Pipe is used in the downcomers.

The "U. S." complete engineering service which designed, accurately fabricated, and Permobond-lined the many complex weldments into a finished, efficient pickling line is available to all industry. Consult any of our 25 District Sales Offices or write to address below.



Duct system lined with U. S. Permobond conveying sulphuric acid fumes to outside of plant. Note U. S. Expansion Joint at right.

"U.S." Research perfects it.
"U.S." Production builds it.
U.S. Industry depends on it.



UNITED STATES RUBBER COMPANY MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting



This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for allstainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

Jenkins extra value construction throughout. Get details - compare. See why they stretch your valve investment dollar - with longer service life, lower maintenance cost.

> GET COMPLETE SPECIFICATIONS from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17. Ask for Bulletin 118.

Every part in contact with fluid is the right metal to block corrosion and beat wear.

COLT NICKEL IRON

- BODIES Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- BONNET Rugged construction, like body. Swing-type gland bolts. Screwedin back-seating bushing. Deep stuffing
- YOKE Integral with bonnet in 2" to 4" sizes.
- WEDGE In 10" to 24" sizes, with Stainless Steel Wedge Rings.
- COVER In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- · GLAND

M

- . BONNET BUSHING
- . SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10" to 24" sizes.
- . SEAT RINGS
- DISC and HANGER in Check Valve

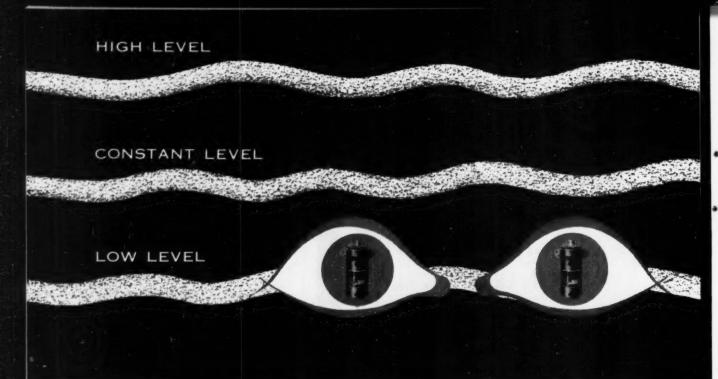
NI-RESIST Type No. 2

WEDGE of 1-beam structure is solid NI-RESIST in 2" to 8" sizes.

PRESSURE RATINGS

2" to 12"-200 lbs. O.W.G. 14" to 24"-150 lbs. O.W.G.

JENKINS VALVES ---- GENKINS



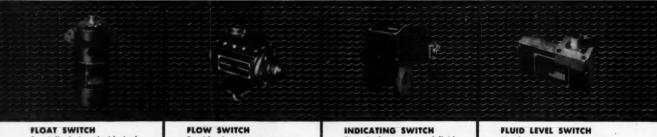
NTS SEE WHERE YOU

See Revere , . . if you need to know — HOW MUCH LIQUID — HOW LITTLE — AT WHAT LEVEL. Revere's precision made instruments are your unfailing eyes that see into sealed tanks, tubes or complex fuel lines. They can provide you with accurate measurement of liquid level regardless of pressure or temperature changes, vibration or rapid acceleration forces, AND they will automatically transmit a warning signal whenever liquid flow or level maintenance varies from a pre-determined value.

These hermetically sealed, magnetically actuated instruments employ balanced float assemblies to minimize false

alarms. Compact and light, Revere instruments meet government specifications. They are available in many different configurations, some of which include relays to handle heavy electrical loads. Others are designed for complete submersion in fluids.

Submit your control problem to our Field Engineering Department today. Revere will provide the instruments to tell you - HOW MUCH - HOW LITTLE - AT WHAT LEVEL. Shown below are some instruments that are the seeing-eyes of aircraft and industry.



Specially designed with single or dual float systems to provide automatic cut-off control for single point high pressure refueling.

Provides instantaneous warning signal whenever liquid flow falls below a pre-deter-mined value. It can be mounted'in any direction.

Records the presence of fluid a line whether stationary or flowing and transmits a warning signal if fluid condition changes.

Used to maintain accurate high level, low level or constant level control of fuels, water-alcohol mixtures, beverages, etc. and other liquids.

SEND FOR FREE BULLETINS

CORPORAT

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for aircraft instruments a n d industry ecision

Just list what you want in an oxidant...

then compare ordinary oxidants with the outstanding values of

WELSBACH ZONE

Whether you must find a replacement for costly conventional exidents or your problem lies in developing new and better products...compare the advantages of Welsbach Ozone with ordinary exidents. Then test it yourself in your own laboratory... in your own process. Welsbach's Model T-23 Laboratory Ozonator can give you proof—that Welsbach Ozone is just what you want in an exident.

WELSBACH OZONE

- 1. Quantitative reaction
- 2. Fully automatic
- 3. Always available
- 4. Constant operating cost
- 5. No materials handling or storage expense
- Purer products—only oxygen added
- 7. Instantaneous reaction
- 8. Reacts at ordinary temperature and pressure

CHEDINARY OXIDANTS

- 1. Inefficient oxidation
- Increasing labor and supervisory cost
- 3. Difficult to procure
- 4. Uncertain chemical price
- Increasing materials handling and storage expense
- 6. Post-oxidative clean-up needed
- 7. Long reaction time
- High temperatures and pressures required

in your own plant . . .

check the advantages of

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720NE PROCESSES DIVISION 1500 Welnut Street Philadelphia 2, Pa.

PIONEERS IN CONTINUING OZONE RESEARCH

Engineers - here's how a Speedline system will cut your piping costs!

on pressure problems

If You Use Schedule 40 Pipe at 150 psi Operating Pressure



Schedule 40: 100 to 1 Safety Factor

Lighter Wall will Meet Pressure Safety Requirements



Schedule 10: 83 to 1 Safety Factor



Schedule 5: 50 to 1 Safety Factor

BUY ALL THE WALL YOU NEED ... DON'T BUY MORE

on flow problems

If You Use Screwed Fittings



You Lose One Half The Wall You Bought—AT THE THREADS

Lighter Wall Plus Speedline Fittings Give You:

GREATER INSIDE AREA · MORE FLOW LOWER PRESSURE DROP







You get greater flow and capacity in light-wall pipe. For example, Schedule 5 has 15% to 25% more capacity than Schedule 40.

on corrosion problems

CORRECT ANALYSIS will combat CORROSION regardless of Wall Thickness

Type	Corrosion	More	Wall?

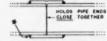
Contamination No advantage
Discoloration No advantage
Intergranular No advantage
Galvanic No advantage
Atmospheric May be advantage
Pitting Little advantage
Inches Penetration
Year May be advantage

CHANGED ANALYSIS and LESS WALL can be GREATER COST ADVANTAGE than CHANGED ANALYSIS and SAME WALL.

Speedline FITTINGS DESIGNED FOR SCHEDULES 5 AND 10 GIVE YOU:

lower installation costs

for labor



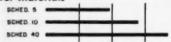
SPEEDLINE ALIGNING CONNECTORS

Speed Installation

*Can be Welded, Fused, Soldered or Brazed

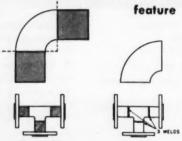
Provide Easy Change-over from Schedule 40 to 5 or 10

for materials



You pay much less for light wall pipe. Here's a cost comparison of the three schedules in 1" size.

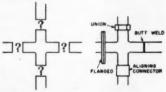
exclusive tangential



Provides Easier Aligning (with or without aligning connectors), more clearance for Welding or Flanging on ALL Speedline Formed Fittings. See gray panel below.

greater flexibility

Type of Joint can be selected "on the job."

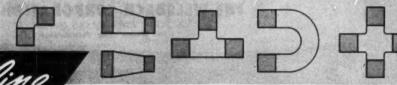


FEWER DESIGN HOURS FEWER INVENTORY ITEMS

SPEEDLINE "Multiple Choice" Fittings eliminate conventional flanged fittings, provide time and cost advantages of simple layouts versus elaborate and costly designs.

Speedline distributors are located in principal cities from coast to coast





Corrosion-Resistant FITTINGS—the newest thing in pipeline economy

Manufactured by HORACE 7. POTTS CO. . 500 E. Erie Avenue . Philadelphia 34, Penna.



The answer to most of your questions about stainless steels are right at your finger tips, when you use Crucible's unique new Stainless Steel Selector.

Want to know the machinability characteristics of a stainless grade? Resistance to corrosion or scaling? Physical or mechanical properties? You can get the answers to these and other questions simply by setting the arrow on the Selector slide at the proper window. It's just as quick and easy as that.

And almost as fast as you get the answer, you can get the steel you need. For many of the REZISTAL stainless steels shown on the Selector are carried in stock in Crucible warehouses conveniently located throughout the

To get your free copy just fill in and mail the coupon. Better do it now.

HOW THE SELECTOR WORKS:

Start with the problem. For example, resistance to corrosion in contact with copper sulfate. Just set the slide at the proper index number shown on the Selector (in this case on the back), and you have the answer in a second - grades 302 and 316 are fully resistant to this form of attack.

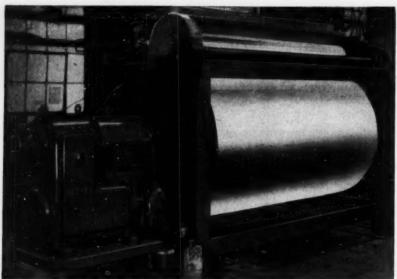
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Pittsburgh, Pa.		
Name		
Name		Title

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

STAINLESS STEELS

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA. REX HIGH SPEED . TOOL . REZISTAL STAINLESS . MAX-EL . ALLOY . SPECIAL PURPOSE STEELS



BUPLOVAK Atmospheric Single Cooler, 5' x 8'5". Used for chilling soap

BUFLOVAK BUILDS

EVAPORATORS

Low-Temperature
By-Product Recovery
Chemicals
Food Products
Crystallization

DRYERS

Vacuum Double Drum Vacuum Rotary Pilot Plant Atmospheric

PROCESSING KETTLES

Mixers
Impregnators
Dopp Kettles
Solvent Recovery &
Distillation Equipment

SEND FOR CATALOGS

RESEARCH AND TESTING

To assist you in the solution of processing problems, BUFLOVAK offers the facilities of its Research and Testing Laboratory... where small scale experimental units show you before you buy, the commercial possibilities, data on production cost, and characteristics of the finished product.

Buflovak FLAKERS & COOLING DRUMS

New Features Speed Production . . . Lower Costs

A uniform, high quality, finished product . . . more of it . . . and at lower cost! That's the operating experience of many industries where BUFLOVAK Continuous Flakers and Cooling Drums are used. There are many new features that give new profit-building results. Large units for flaking products of low melting point have drums equipped with spray nozzles located on the inside of the drum to provide uniform cooling. For small flakers and products of high melting point, the cooling drum is provided with a special internal baffle that insures uniform cooling and exceptionally high heat transfer. The cooling mediums may include water, brine, or direct expansion.

BUFLOVAK Flakers can be equipped with a wetting roll that deposits a thin film of moisture on the surface of the drum before it dips into the hot material. This arrangement facilitates the removal of the film of product from the drum, thereby increasing production, lowering power, and greatly increasing the life of the knife.

BUFLOVAK Flakers are built in open or closed types. The latter eliminates dust and toxic hazards in handling poisonous material. They are available in several sizes of any suitable material of construction, with individual modifications to suit various applications; such as, steam jacketed, direct fired, or electrically heated feed pans.

BUFLOVAK Flakers are extensively used in the Chemical industries to produce a granular or flaked material from such products as caustic soda, phthalic anhydride, asphalt, DDT, benzine, hexachloride, pitch, naphthalene, sodium sulphide, calcium chloride, stearic acid, niter cake, many intermediates, and liquids which solidify upon cooling. This process offers continuous operation, a large capacity, and a finished product which is free from lumps.

The technical staff of BUFLOVAK can help you with your flaking and cooling problems.

You will be sure of better results from BUFLOVAK!

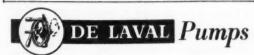
Send for Catalog 352

BLAW-KNOX

BLAW-KNOX COMPANY
BUFLOYAK EQUIPMENT DIVISION

1551 FILLMORE AVE.
BUFFALO 11, N.Y.

Which of these is your pumping problem? CARBON SUGAR HYDROLUE FURFURAL MOLASSES LIQUOR SLURRY O O LIQUID LINSEED SULPHUR EDIBLE RESINS CONDEN SOA 0 O Ó O O CAUSTIC CHOCOLATE PAINT Name just about any fluid you consider 0 0 "hard to handle" and we will show you a De Laval pump that will do the job effi-WASTE ciently and at low cost. GRINDER FUEL GLYCO SULPHITE De Laval IMO and CPO pumps have LIQUO solved problems on a wide range of prod-O O ucts-hot or cold, acidic or alkaline, vis-O cous or corrosive, clear or filled with suspended solids. IMO and CPO models are BENZIN ASPHA available for early delivery. Your De Laval representative is an ex-O 0 perienced application engineer. Consult him on your pumping problems or write today for literature. CALCIUM LUB CANE WASH DE LAVAL capacities to 750 gpm pressures to SYNTHETI 1500 psig INK GASOL O O AMMOR capacities to 2000 gpm heads to



200 feet

DE LAVAL STEAM TURBINE COMPANY Nottingham Way, Trenton 2, New Jersey

NEW TYPE STURTEVANT AIR SEPARATOR

Recovers Fines in Micron Ranges

Now the famous Sturtevant Whirlwind Air Separator, so widely used throughout industry for fast recovery of fines, has been specially designed to "pick-off" classified materials such as pigments, limestone fillers, plastics, oyster shells, etc., in micron sizes.

These highly efficient air separators select a continuously uniform product of desired fineness. Used in a closed circuit with grinding mills, they increase production, cut power costs.

Large feed opening, rugged construction, ease of adjustment, low power consumption assure economy of operation and minimum upkeep. Write for further information.

STURTEVANT

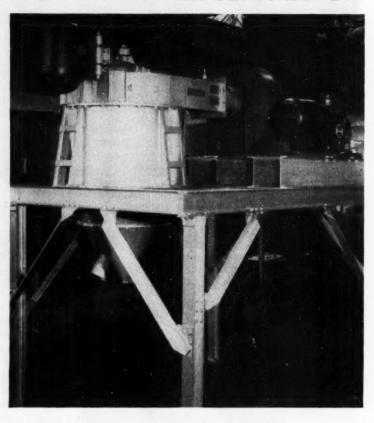
MILL COMPANY 100 CLAYTON STREET BOSTON 22, MASS.

Designers and Manufacturers of:

CRUSHERS • GRINDERS • SEPARATORS

CONVEYORS • MECHANICAL DENS and

EXCAVATORS • ELEVATORS • MIXERS



OTHER STURTEVANT EQUIPMENT



MICRONIZER @ GRINDING MACHINE

A fluid jet grinding machine, the Sturtevant Micronizer speeds reduction of materials to low micron sizes. These jet mills are especially applicable in fields where a particle size in microns is desired.

Sturtevant Micronizer grinding machines are available in many sizes and capacities.



RING-ROLL MILLS

For medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operate in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



CRUSHING ROLLS

For granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8 x 5 to 38 x 20. The standard for abrasives.



BLENDER

Four-way mixing action assures a thoroughly blended product. Open-door accessibility permits easy cleaning. Available in many mixing capacities for \(\frac{1}{2} \)-ton per hour and up.

GLOBE Seamless GLOWELD Welded

- Resistance to Corrosion
- Strength at High Temperatures
- Resistance to Oxidation at High Temperatures
- Ease of Fabrication

TYPICAL ANALYSES AND TYPES:

302	309S	316Cb	330	410
302B	309Cb	317	347	430
304	310	321	403	443
308	314	329	405	446
309	316	INCONEL	* - NICHRO	ME **

*Registered U.S. Trade-Mark *Trade-Mark Reg. U.S. Pat. Off. D-H Co.

Globe produces more than 26 standard analyses of stainless steel tubes — also special analyses when required. Because varying analyses have widely varying service characteristics, Globe will make recommendations only after careful study of your particular problem.

GIL BE specialization...

meets your exact

requirements in

STAINLESS STEEL TUBES



Write for Bulletin 333 — Corrosion and Heat Resisting Steel Analyses Chart — a valuable reference tabulation of stainless steel analyses as produced by various manufacturers.

SIZE RANGE:

Globe seamless stainless steel tubing may be had in sizes from ½ inch to 6 inches O.D., and in pipe sizes ½ inch to 6 inches, standard, extra strong and double extra strong weights.

Gloweld electric welded stainless steel tubing is available in sizes ranging from ¼ inch to 5 inches O.D. inclusive; in standard weight pipe (schedule 40) sizes ½ inch to 2 inches—lightweight pipe (schedule 5 and 10) ½ inch to 4½ inches inclusive

TOLERANCE RANGE:

All stainless tubing furnished to standard A.S.T.M. specifications unless otherwise specified to suit your particular application requirements.

Globe specialization gives you uniform high quality...

Precision checks — and re-checks — at every stage of production insure Globe stainless steel tubes that meet your exacting specifications. For more than thirty years, specialization in production of steel tubes has key-noted all Globe research, engineering and mill operations. Write for the Globe Stainless Steel Tubes catalog.

GLOBE STEEL TUBES CO., Milwaukee 46, Wis. Chicogo — Cleveland — Detroit — New York — Philadelphia — St. Louis — Denver — Houston — Sen Francisco — Glandele, Cel.

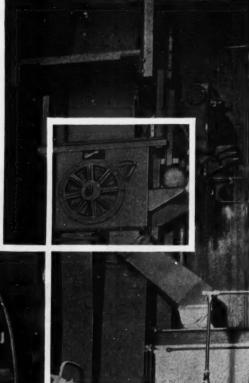
Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy — carbon seamless steel tubes — Globeiron (high purity ingot-iron) seamless tubes — Globe welding fittings.



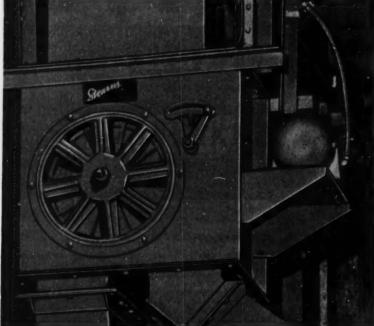
Piercing, rolling and reduction of seamless tubes is closely monitored from this control room — typical of the highly specialized equipment in the Globe mill.



Here's <u>non-stop</u> protection from tramp iron



This drum-type Stearns automatic spout magnet is removing tramp iron in a new push-button feed plant in Goshen, Indiana.



Install a Stearns drum-type magnetic spout separator and forget about tramp iron hazards. This efficient Stearns unit removes destructive bolts, nails, tacks, etc. from your product — continuously, automatically!

Stearns magnetic specialists study every aspect of your installation, then design and build a magnetic separator that's tailored exactly to your plant and product.

Take a positive step to plant safety and product purification. Write today for Stearn's bulletin 93-E.

MAGNETIC EQUIPMENT FOR ALL INDUSTRY

STEARNS



MAGNETS

STEARNS MAGNETIC. INC.

Here's how it protects your product

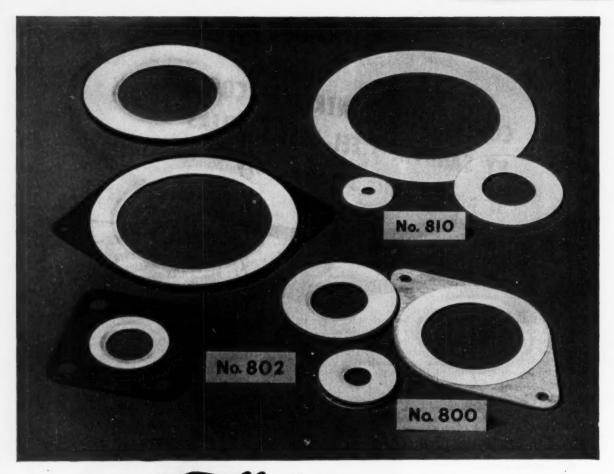
Material in process can be fed into the separator at any angle, over a stainless steel cylinder surrounding a stationary electro or permanent magnet. As this material passes through the magnetic field, the contaminating tramp iron is held to the face of the cylinder and carried to a point beyond the magnet's pulling force and dropped into a discharge chute! The purified product falls by natural trajectory into a separate chute and continues through its production process.

No levers — no cleaning — no timewasting interruptions. Deep, powerful magnetic field of a Stearns separator insures positive protection — even with large amounts of fast-flowing material.

1079

629 S. 28th St., Milwaukee 46, Wis.





Meloni Gaskets are ideal for chemical use

Gaskets made of R/M TEFLON* are not affected by any industrial chemicals or acids. They are resilient and conform to rough and out-of-line flanges. They are ideal for use on glass lined reactor kettles; handholes and manholes; distillation columns; valves, flanges and tank covers; glass lined pipe flanges and nozzles. Two types are illustrated above: R/M Nos. 800 and 802, "French" or envelope gaskets for light flanges with low bolt loads,

and R/M No. 810, solid rings for standard ring type flanges.

Protect your costly chemical equipment with R/M Teflon Gaskets. Each one is carefully engineered to your performance requirements. See your R/M distributor for full details. The complete R/M Teflon products line includes rods, sheets, tubes, tape, packings, gaskets, rings and irregular shapes.

*Du Pont's trade-mark for its tetrafluoroethylene resin

R/M MAKES A COMPLETE LINE OF PACKINGS AND GASKETS AND SELLS THEM ONLY THROUGH AUTHORIZED DISTRIBUTORS



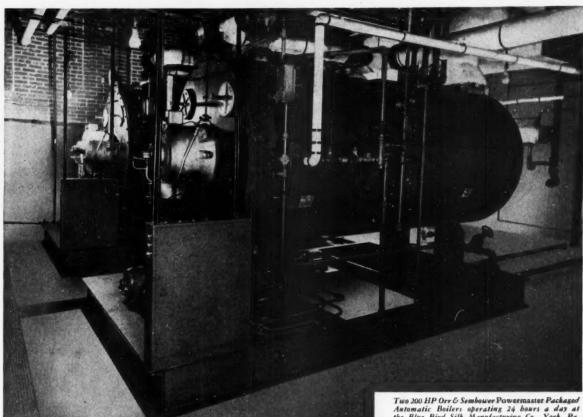
PACKINGS

RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, MANHEIM, PA.

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada.

RAYBESTOS-MANHATTAN, INC., Packings - Asbestos Textiles - Industrial Rubber, Engineered Plastic, and Sintered Metal Products - Abrasive and Diamond Wheels - Rubber Covered Equipment - Brake Linings - Brake Blocks - Clutch Facings - Fan Belts - Radiator Hose - Bowling Balls

IN TEXTILE MILLS..



Two 200 HP Orr & Sembower Powermaster Packaged Automatic Boilers operating 24 bours a day at the Blue Bird Silk Manufacturing Co., York, Pa.

Powermaster Performance Pays Off

CTEAM COSTS DOWN 20% - negligible mainte-Inance. That's the two-year performance record of these two Powermaster Packaged Automatic Boilers operating round-the-clock at the Blue Bird Silk Manufacturing Company, York, Pa.

In addition to the cost-saving advantages, these units provide dryer, higher quality steam for processing and heating than the coal-fired boiler they replaced. Burning No. 6 Bunker C oil, they produce 13,800 pounds of steam per hour. And Powermaster's Voriflow burner design assures top straight line efficiency when operating between 30% and 100% of capacity.

Check these reasons why Powermaster is today's best In sizes to 500 HP; pressures to 250 psi.

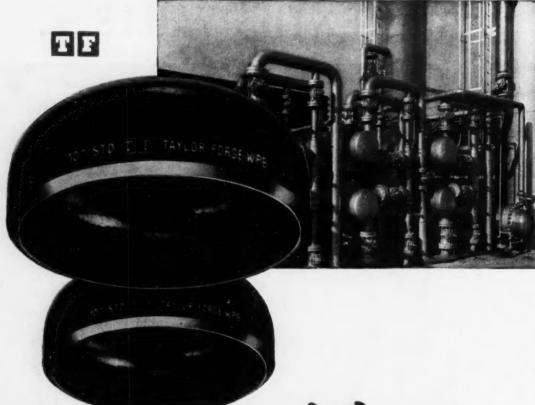
buy for textile mills, schools, hospitals, industrial plants and all types of buildings: Cost-saving installation, space-saving compactness, dependability, fast steaming, hospital-clean operation, maintenance-saving accessibility, fully automatic operating and safety controls and smokeless combustion.

Find out why satisfied users all over America are saying, "Steam costs go down where Powermasters go in". Send for latest descriptive bulletin.

PACKAGED AUTOMATIC BOILERS



ORR & SEMBOWER, INC. • Established 1885 • Morgantown Road, Reading, Penna.



Caps are part of the story



The announcement of the WeldELL line, back in 1931, created a considerable sensation in the piping field. Pipe welding was then just beginning to emerge from the crude, cut-fit-patch stage and the only welding fittings then in use were simply elbows.

But here was a full line of welding fittings—not only the long and short radius ells, but also full branch and reducing tees, concentric and eccentric reducers, stub ends, welding neck flanges... even caps!

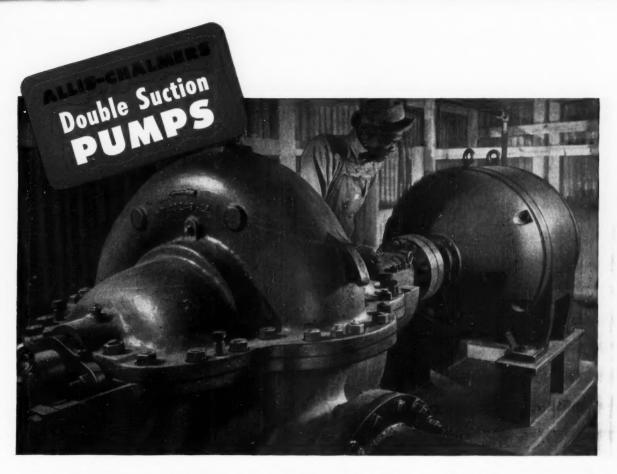
You know what happened: The WeldELL line had taken pipe welding out of darkness into light . . . had provided the impetus and set the pattern of modern pipe welding practice.

Yes, the WeldELL line was the first complete line—the first engineered line... and the fittings that showed the way are still showing the way. For up-to-the-minute facts about the WeldELL line see your Taylor Forge Distributor.

TAYLOR FORGE



General Offices and Works: P. O. Box 485, Chicago 90, Illinois Offices in all principal cities • Plants at: Carnegie, Pa.; Festana, Calif.; Gary, Ind.; Hamilton, Ont., Can.



CUT PUMPING COSTS

Get an Allis-Chalmers pump with:

- HEAVY DUTY CONSTRUCTION Extra metal thicknesses, extra strong parts, no skimping.
- WIDE MATERIAL CHOICE Iron, bronze, stainless steels and combinations to handle practically any liquid.
- MANY OPTIONAL FEATURES Choice of sealing methods and bearing arrangements for special requirements.
- UNIT RESPONSIBILITY Pump, motor and control a complete unit supplied and guaranteed by Allis-Chalmers.

FOR ALL GENERAL USES AND MANY SPECAL PROCESS APPLICATIONS,

Allis-Chalmers double suction pumps are built with that extra measure of strength and ruggedness that assures you long life and low maintenance.

Every Allis-Chalmers double suction pump is carefully tested on the most modern electronically controlled pump testing equipment in the industry. Each installation is individually engineered by men whose experience in thousands of pump installations will give exactly the right pump for your needs.

Whatever your pumping problem, call your nearby Allis-Chalmers Authorized Dealer or District Office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 08B6146.

Sold . . .

Applied . . .

Serviced . . .

by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.



MOTORS — 1/2 to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.





TEXROPE V-belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-4287



INTERMOUNTAIN CHEMICAL CO.'S Wyoming plant, produces 300,000 tons per year of refined soda ash.

Natural Soda Ash [FLOWSHEET

The \$18 million Westvaco plant at Westvaco, Wyo. produces a high quality soda ash from trona. Uses new refining process.

The first big, new, soda ash plant to be built in 17 years—Food Machinery and Chemical Corp.'s process at Westvaco, Wyo.—is in full scale operation.

Using natural ore, the \$18 million investment is operated by FMC's Westvaco Chlor-Alkali Division for the Intermountain Chemical Co.

► Many Uses—Soda ash is the third largest chemical produced in this country. Over five million tons are used every year to refine minerals, make glass and soap, wetprocess textiles, produce aluminum, digest pulp and paper, soften water and facilitate scores of other operations.

About 94 percent of all this soda ash is made by the ammonia-soda process. It takes a large capital investment to build one of these plants. As a result no new plant has been built in 17 years. The significance of the Westvaco process is this: it takes advantage of a wholly new and different source of material to produce this important chemical. And allows for an efficient, low cost plant.

▶ The Process—Trona ore is mined & of a mile beneath the waste lands of Wyoming. This trona is a nonmetallic mineral compound of hydrous sodium carbonate and sodium bicarbonate. It contains less sodium chloride and sodium sulphate than refined ammonia-soda ash. Brought up from the mine, it's converted to refined soda ash—to the tune of 300,000 tons per year.

Some of the most advanced and modern mining techniques are used to get the ore out. Undercutting, drilling, blasting and loading operations are mechanized to the fullest. An ingenious mechanical loader picks up the ore dust and conveys it to a shuttle car. From there it goes to a system of conveyor belts to a crusher. Skip hoists lift the crushed ore to the surface.

On the surface, raw, mined trona goes through a screening and crushing operation—in preparation for dissolving. It's then fed to a battery of three dissolvers where solution takes place in mother liquors and make-up water. The solution is kept at the boiling point of water—200 deg.F. at 6,200-ft. elevation.

▶ Impurities Removed—Trona solution goes to an 80-ft. Dorr classifier. Treatment in the classifier with oxidizing and settling agents brings out impurities like Fe, Al and Si. Shale also separates out at this stage. The waste product is fed to a Dorr thickener and discarded.

From the clarifier, the clear solution is "polished" in a filter press. Trace amounts of impurities which cause foaming in the crystallizer are removed here.

In a Struther-Wells vacuum crystallizer, the trona solution crystallizes out to a 20-30 percent slurry. Concentration of this slurry takes place in a settling tank and centrifuge.

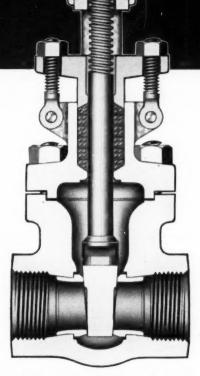
The centrifuge feeds a calciner and dryer. Here is where trona—Na₂CO₃ • NaHCO₄ • 2H₄O is converted to soda ash—Na₂CO₃; by driving off excess CO₂ and water.

From the dryer, the product goes to storage bins and then to shipping.

You get Big Valve quality in these SMALL

600-POUND

STEEL GATES by CRANE



BOLTED BONNET OR UNION BONNET

In the cross-section of the bolted bonnet pattern above, you can see the rugged big-valve construction. Bolted bonnet valves available in sizes ½ to 2-inch—union bonnet valves in sizes ¼ to 2-inch.



Screwed Ends—Union Bonnet or Bolted Bonnet



Socket-Welding Ends-Bolte



Flanged Ends— Boited Bonnet only

Look no further for dependable steel valves in sizes up to 2-inch. Whether you prefer the union bonnet or bolted bonnet pattern, you get refinements usually found only in larger, more expensive valves.

For example, you get a compact, weight-saving structure of highquality carbon steel. Smooth operation and positive closure of the solid wedge disc are assured by a T-head disc-stem connection and full-length machined guide ribs. There's also an unusually large stuffing box filled with high-grade packing, a leakproof bonnet joint with retained gasket, a husky stem with outside threads, and many others. To simplify maintenance, Crane design includes swinging gland eye-bolts—plus a wide yoke with liberal working space around the gland.

USER'S CHOICE OF TRIM

There's versatility to these quality Crane steel valves, too. You can have your choice of trim to suit your service—Class X Trim (Exelloy body and body seat rings) for oil or oil vapor—Class XW Trim (Exelloy seat rings, disc of hardened stainless steel) for steam or water. Union bonnet valves also available with Class L Trim (18-8 Mo Alloy seats, disc, stem) for liquids and gases up to 750° F.



Full details in 6-page folder AD-1881. Ask your Crane Representative next time he calls, or write direct.

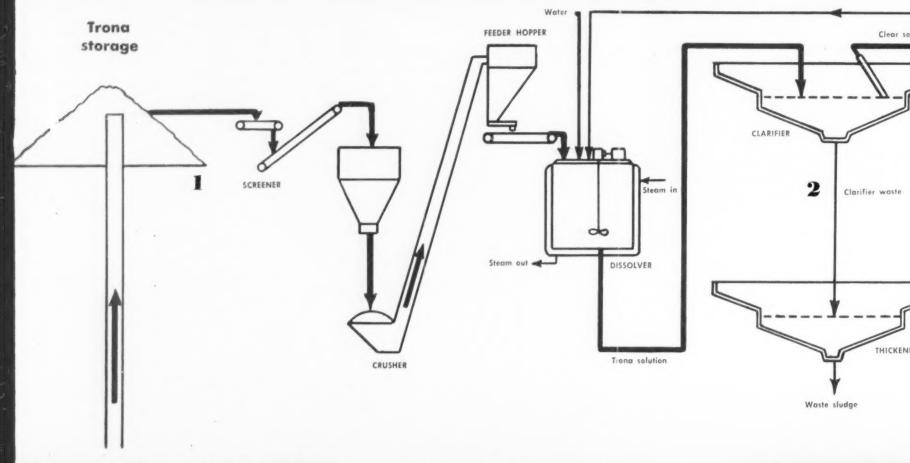
THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Illinois Branches and Wholesalers Serving All Industrial Areas



VALVES . FITTINGS . PIPE . PLUMBING . HEATING

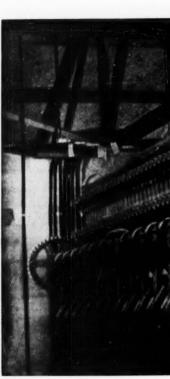




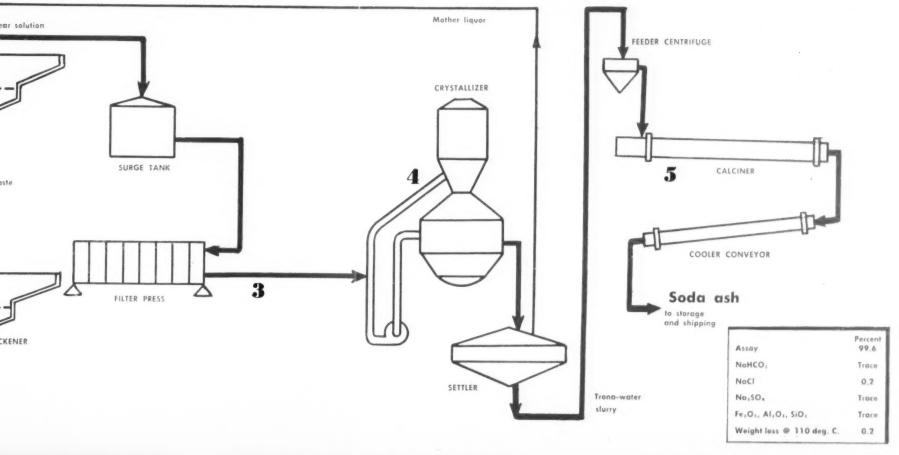
MINING of trona. A shuttle car discharges ore onto a conveyor.

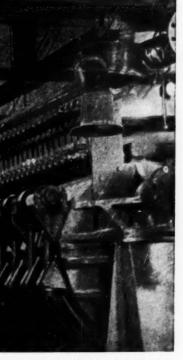


2 SETTLING and thickening tanks remove impurities from the ore.

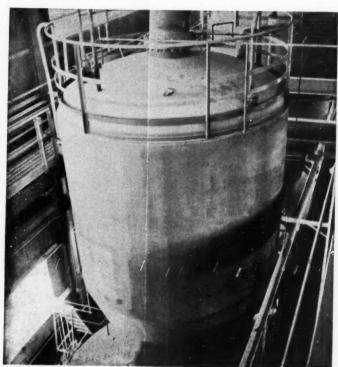


3 FILTER PRESSES remove trace of

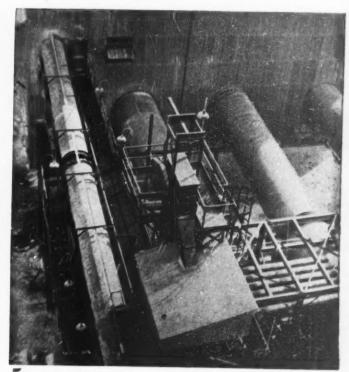




ce contaminants which produce foaming.

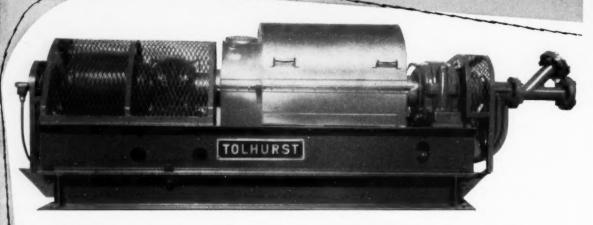


4 VACUUM crystallizer where the trona ore solution is concentrated.



5 CALCINERS convert crystallized ore to dry, refined sods ash.

MAXI-FLEX" CONTINUOUS CENTRIFUGAL



Matches its operation to your specific requirements

If your plant runs continuously on a single product, process fluctuations or changes in technique need no longer pose a problem in the centrifuging step. The Tolhurst Maxi-Flex provides:

- ★ VARI-BEACH DRIVE which allows instantaneous change of beach speed from 0 to 300 inches per minute.
- ★ VARI-POOL ORIFICE PLATES which offer a choice of seven different pool depths.
- ★ HIGH F x G a centrifugal force field which can be varied up to almost 2000 times gravity.
- * SELF-CLEANING FEED CHAMBERS

★ FULL BALL AND ROLLER BEARINGS which permit more compact inner bowl design. This design minimizes bowl deflection even when viscid materials are processed at high speeds.

These Maxi-Flex features now make it possible for you to enjoy the economies of continuous centrifuging even if your plant has short runs on different products.

FREE 90-DAY TEST IN YOUR PLANT—If you would like to investigate the application of a Maxi-Flex Continuous to your specific conditions, let's discuss a free 90-day test in your plant. No obligation, of course.

Tolhurst

Division of American Machine and Metals, Inc. EAST MOLINE, ILLINOIS

--- MAIL COUPON TODAY --

TOLHURST CENTRIFUGALS DIVISION, Dept. CE-354
American Machine and Metals, Inc., East Moline, Illinois

- Send information about 90-day free test. We are processing
- Send new bul'etin on Maxi-Flex Continuous Centrifugal.

FIRM NAME

ADDRESS

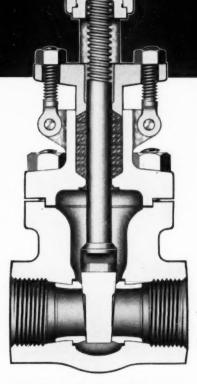
CITY & ZONE

STATE

NAME AND TITLE

You get Big Valve quality in these SMALL 600-POUND STEEL GATES

STEEL GATES by CRANE



BOLTED BONNET OR UNION BONNET

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Socket-Welding Ends—Bolter Bonnet or Union Bonnet



Flanged Ends— Bolted Bonnet on

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CRANE CO., General Offices: 836 S. Michigan Ave., Chicago 5, Illinois Branches and Wholesalers Serving All Industrial Areas



VALVES . FITTINGS . PIPE . PLUMBING . HEATING

The New Raymond RAY DU

WITH SCREEN SEPARATION

A Low-Cost Producer for pulverizing small lots of medium soft materials





SCREEN UNIT

THESE modern RAY-DUCER Mills represent a new and advanced design of hammer-type pulverizers . . . another addition to the Raymond line of fine grinding equipment.

They are especially designed for pulverizing or disintegrating a wide range of medium soft materials to specified screen fineness where moderate capacities are required.

Their high-speed hammer action reduces the material rapidly to a uniform powdered product at exceptionally low cost and insures a consistent finished material suitable for special chemical and manufacturing processes.

Raymond RAY-DUCERS offer many advanced features; as well as new ease of control, simplicity of operation, and quick accessibility of interior parts.

Only a few seconds are required to open up the mill for quick cleaning or changing screens. This saves valuable time in setting up, or handling different materials with frequent changes between runs.

If you have a small capacity grinding problem, the RAY-DUCER may be an economical solution . . . write for details and tell us your requirements.

For Details write for Bulletin Number 73



COMBUSTION ENGINEERING, INC.

1311 NORTH BRANCH ST.

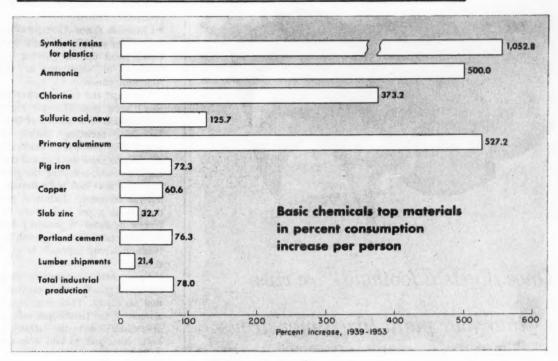
CHICAGO 22, ILLINOIS

SALES OFFICES IN

REINCIPAL CITIES CHICAGO 22, ILLINOIS

SSIBILITY

TILT CARRIER



Per Capita Use of Basic Materials Soars

Getting out of the astronomical figures you normally associate with our economy, here's an easily grasped picture of how U. S. consumption of materials has grown.

Americans are so used to big figures—millions of tons, billions of dollars—that they don't make much of an impression any more.

A lot of economists, for instance, expect total business in the economy to drop by about \$18 billion this year. Yet most of them don't seem very worried about it. After all, that's only 5 percent of our total output of goods and services.

Again, some observers expect steel production to drop by about 17 million tons between 1953 and 1954. But the amount of steel that will be produced even after the drop is so great—95 million tons—that 17 million doesn't seem like much.

► Change the Basis—When figures get this big they become cold statistics and lose most of their meaning for the ordinary human being. So sometimes it's helpful to express them in alternate ways that make their real significance clear.

For example, that 17 million tons of steel is enough to make more than eight million new cars—still a large figure, but easier to visualize than a pile of steel ingots.

Or the possible drop in steel production can be compared with production in other nations. It's roughly equal to the total steel output in England last year.

Putting large statistics on a per capita basis is still another way to make them make sense. Seventeen million tons of steel, for instance, is equal to a little more than 200 pounds for every man, woman and child who will be living in the U.S. this year. (Population will prob-

ably average about 162.4 million in 1954.) And the possible \$18 billion drop in production of goods and services would be over \$115 per capita—more than \$450 for a typical family of four.

Economic growth can be measured on this basis, too. Obviously, if the population grows by 10 percent in a period of years, and industrial production also grows by 10 percent, we're no better off than when we started. Showing production and consumption figures on a per capita basis often gives a better picture of real economic gains and

Estimated Consumption of Basic Raw Materials Per Capita, 1939-1953

		2.
	1939	1953
Synthetic resins for		
plastics, lb	1.63	18.79
Ammonia, lb	4.8	28.8
Sulfuric acid, new, lb	72.7	164.1
Chlorine, lb	7.41	35.07
Primary aluminum, lb.	2.50	15.68
Pig iron, lb	537.9	926.7
Copper, lb	10.9	17.5
Slab zinc, lb	9.27	12.3
Lumber shipments, bd.		
ft	198.3	240.7
Portland cement, bbl	0.93	1.64



Once it gets a foothold, fire rips

into your plant like a monstrous

claw. That means you must guard

every hazard—flammable liquids,

electrical equipment as well as

ordinary combustibles—with

Kidde Portable Extinguishers or

Built-in Systems.

Call your Kidde agent today.



Walter Kidde & Company, Inc.
328 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

changing patterns than do straight production figures.

Chemicals Zoom—Changes in per capita consumption of basic materials point up the growing importance of chemicals in the American economy.

The chart and table (preceeding page) show growth in per capita consumption of a number of basic materials—excluding fuels—between 1939 and 1953. Practically all products show some growth during the period, reflecting the great expansion that took place throughout the economy. (Industrial production on a per capita basis increased by about 78 percent.) But the difference in rate of growth between different materials is quite striking.

Basic chemicals generally show the fastest growth rates in consumption per capita. This, of course, is a result of the tremendous volume of research done by the industry to lower costs and to find new end products.

Chemicals have also benefited by the rapid growth of some of their older end products, like fertilizers. And, in addition, they're playing a growing part in the processing of other basic materials, such as metals (see Chem. Eng., Jan. 1954, p. 379).

▶ Resins Lead—Synthetic resins for plastics show the greatest gain of the materials on the chart, partly because they're the newest of those listed. Consumption shot up more than 1,000 percent—per capita—between 1939 and 1953. Since 1951, per capita consumption has increased nearly 20 percent and the chances are that these products will go right on showing big gains.

Ammonia is next, with an increase of 500 percent in per capita consumption. Ammonia's gains reflect, among other things, the big growth in the use of fertilizers and plastics.

Chlorine gained about 373 percent, and even sulfuric acid, one of the oldest chemicals around, jumped 125.7 percent. The U. S. consumed about 164 pounds of new sulfuric acid per person in 1953, as compared to only 72.7 pounds in 1939.

These percentages could be dwarfed, of course, if some of the new chemical products were considered. Many of today's important materials were hardly dreamed of in 1939. But our object is to compare basic, big-volume materials of relative long standing so fast growers like acrylonitrile and titanium are not included.

► Aluminum Paces Metals—Not unexpectedly, aluminum is the leader among the important metals, with a per capita increase of about 527 percent for the primary metal. Aluminum is, of course, largely a product of chemical processes—as are increasing numbers of other metals.

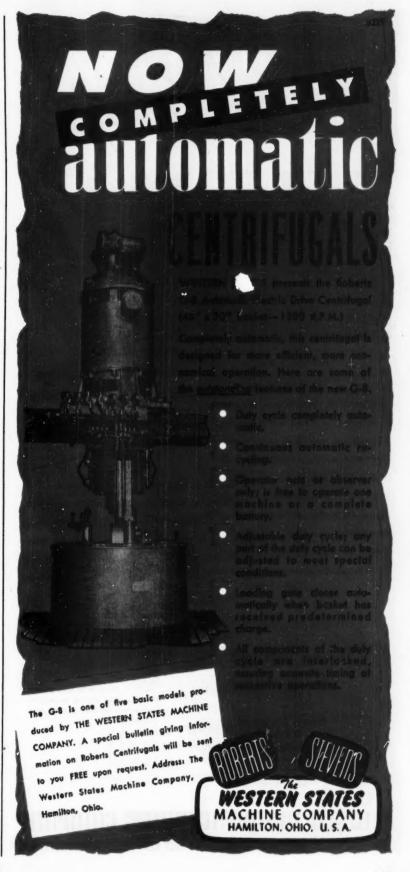
Like basic chemicals, aluminum has benefited both from the development of new markets and from the big growth of older outlets, particularly aircraft. And, like many chemicals, its cost has declined sharply compared to the cost of most competitive materials.

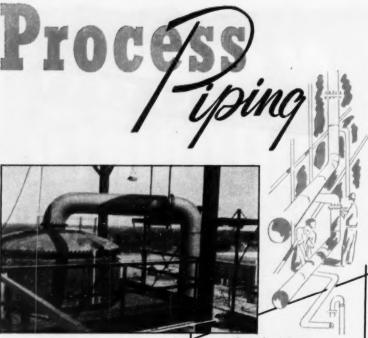
Three other major metals—copper, slab zinc and pig iron—also experienced marked increases in consumption over the 1939-53 period. But they all fell far short of the spectacular gains made by aluminum and most major chemicals.

Consumption of pig iron gained most—up 72.3 percent on a per capita basis. Use of copper increased 60.6 percent and slab zinc consumption picked up nearly 33 percent. Slower gains for these metals reflect the fact that they've been in use for many centuries and it's no longer so easy to find new uses for them. Also, they've had increased competition from other materials, especially aluminum.

Basic building materials other than metals also gained over this period—as would be expected since physical volume of construction increased by about two-thirds between 1939 and 1953. Shipments of portland cement rose 76.3 percent per capita—compares favorably with gains made by most major metals—but shipments of lumber were up only 21.4 percent per person.

More-all Comparison — Gains made by these basic materials should also be compared with growth in total industrial produc-





The engineering guidance manifests itself chiefly in two ways: (1) in designing the layout and in selecting materials and sizes to fit the processing problem when such cooperative help is desired by the purchaser; or (2) in double-checking specifications. Both of these engineering services are backed by broad knowledge of processing and an appreciation of how process piping is suppose to function and what is needed to resist cor-

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rosion, pressure and temperature; also how to handle best the inevitable expansion when a cold-hot cycle is in the operation.

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tion. On a per capita basis, consumption of the chemicals listed, except sulfuric acid, increased at least 4 times as fast as industrial production between 1939 and 1953. Use of synthetic resins for plastics grew more than 13 times as fast as industrial production.

Of the other materials listed, however, only aluminum grew markedly faster on a per capita basis than total industrial output. Sulfuric acid was slightly above the average, pig iron and portland cement just about kept up, the others fell behind.



Amid feverish expansion . . .

Poland Eyes World Chemical Markets

Although not a country we normally think of as a major producer of chemicals, Poland is making huge advances in this field. Chemical expansion jumped 518 percent from 1938—last peacetime year—to the end of 1952, faster than any other Polish industry. And that's just the beginning.

New plants scheduled to come on stream this year and next will aflow the country to get into export markets in a big way. Already production of many products is surpassing domestic needs, resulting in considerable export quotas for such chemicals as caustic soda, calcium chloride, formalin, dyes and pharmaceuticals. Here's a partial

list of what some of the industries are doing:

► Sulfuric Doubles—Two sulfuric acid plants, one near Wizow completed in 1951, the other due in just a few weeks at Lesko, are scheduled to produce as much acid as all other Polish plants combined. The Wizow installation starts with anhydrous calcium sulfate; straight gypsum is the raw material at Lesko. Sulfuric acid production in 1938 was about 181,000 metric tons. Capacity in 1952 was rated at 410,000 metric tons, actual output at 369,000 metric tons.

Much of this increased acid output will undoubtedly go into the production of fertilizers, as will a major part of the production of a modern nitrogen plant now practically completed near Kedzierzyn. This plant will turn out more nitrogen than the total now being produced in the rest of Poland and points up the increased attention now being given to aids to increased agriculture output by the Warsaw government. The Felix Dzierzynski plant in Tarnow (see cut, left), one of the largest nitrogen installations in Poland, is also expanding at a fast clip.

The soda industry is abuilding, too. A large plant under construction near Inowrocaw is scheduled to produce caustic, chlorine, ammonium hydroxide and several other basic chemicals. In 1938, Polish outputs of caustic soda and soda ash, including calcined soda, were 30,000 metric tons and 87,000 metric tons. Estimated production in 1952 was 72,000 and 167,000 metric tons, slightly below the planned schedules of 79,300 and 185,000 metric tons, respectively. ► Who Controls-All this expansion is naturally costing a whale of a lot of money. And two combines, just in production, are doing practically all the spending in the organics field. Between them they cover the entire domestic Polish demand for organic raw materials.

One of these, located in Oswiecim, starts with natural gas and produces mostly intermediates. The other-formerly the German Oder Werke-offers organic end products.

As in most iron curtain countries, the government owns much of Poland's industry outright. A







FERTILIZER - Key Poland's agricultural program.

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case in point is the artificial fiber plant at Gorzow. Completely controlled by the government, it is now being greatly enlarged and modernized so as to better utilize by-products.

Fertilizers are booming, too. According to the expansion schedule, 1953 production of nitrogen fertilizers was 340 percent greater than in 1949. Phosphorus fertilizers were also up over 300 percent and an eleven-fold increase was achieved in pesticide-insecticide output.

Other industries that have made big progress in the last few years are wood processing and pharmaceuticals. Drug production last year, including significant quantities of antibiotics and anti-T. B. drugs, is estimated at seven times the 1949 level.

▶For 1954-Synthetic fuels and lubricants are slated for further expansion this year, as is synthetic rubber. And the synthetic resin industry should be operating at 20 times the 1949 rate, paints at 8 times and rubber at about 4 times.

Naturally, all this increased production needs markets. And with the domestic market about satisfied, Poland is turning to exports. Among the inorganics to be exported are caustic, calcium chloride, alum, arsenic, carbide, tin salts, antichlors, hydrogen sulfide and sodium chloride.

In the organic field, Poland is offering dyes, beta-naphthalenes, formalin, gamma-acids, H-acids, benzidene, paratoluidine, aniline and turpentine. Certain coal derivatives are also on the list, incluing benzol, naphthalene, coal and graphite electrodes and other electrode materials.

Of course, the Polish chemical industry was just a midget in 1949 and some of these expansion figures might not look so big on a tonnage basis. But nevertheless, the growing list of products that Poland is now in a position to export gives warning of increased competition from a little-suspected source.

CMRA Plans Session On Electrochemicals

Fresh from a very successful joint meeting with the American Chemical Society in Washington on government statistical aids to business, the Chemical Market Research Assn. has scheduled an all-day meeting on electrochemicals and their derivatives. Place: Hotel Niagara, Niagara Falls, N. Y. Date: Feb. 25, 1954.

Departing from their normal intensive market studies, CMRA members will concentrate mostly on the chemistry of these products at this meeting. Included are calcium carbide, carbon tetrachloride and perchlorethylene, peroxides, chlorates, sodium, caustic soda, caustic potash, chlorine and hydrochloric acid.

Featured speaker is Gen. Clinton F. Robinson, Pres., Carborundum Co., who will discuss company planning at the banquet session.

Lab Equipment Sales Show Big Gains in 1953

Increased competition seems to be bringing renewed emphasis on quality and process control and on research and development by all industry, according to figures released through the Scientific Apparatus Makers Assn.

Based on an eleven month comparison with 1952, net sales of laboratory equipment by Association members jumped more than 9 percent last year. Laboratory apparatus members chalked up a 7:4 percent gain.

Industrial instrument makers took it on the chin, though. Dollar volume of various electronic components and instruments dropped 15 percent in 1953. Most of the

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ECONOMICS . . .

blame is put on slackening military and defense requirements.

For the future, the industry seems confident. Renewed efforts on the part of manufacturers to cut production costs through the use of automatic equipment based on electronic instrumentation — automation—are expected to produce substantial growth of industrial instrumentation keyed to civilian production needs.



U. S. Rubber's Humphreys predicts . . .

Good Year Ahead For Rubber Industry

Rubber consumption in 1954 is expected to be the second highest in history, down only 4 percent from the record 1,333,000 long tons converted into finished products last year. Industry sales, estimated at \$5.5 billion in 1953, may be about 7 percent lower this year. So says H. E. Humphreys, Jr., Pres., U. S. Rubber Co.

Since new car and truck output will drop this year, sales of tires to this outlet will naturally go down, too. But replacement tire demand should rise about 2½ percent, so the over-all picture isn't too bad. Total tire sales are expected to be about 90 million, as compared to 93 million last year and 85 million in 1952.

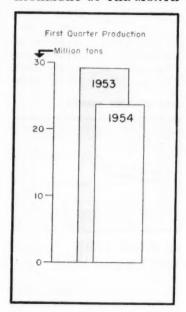
On the non-tire front, demand for industrial rubber products will continue high, although not as strong as in the last two years. Increasing demand for power wire and cables, transmission belts, plastic pipe and other plastic industrial products will at least partly offset any declines in other lines.

The market for foam rubber is increasing rapidly. Added sales to the furniture industry are expected to more than make up for the cutback in auto production.

The industry's chemical business is burgeoning, too, particularly plastics. The outlook for reinforced plastics for car and truck bodies and as a material of construction is considered excellent.

A stabilizing influence for the rubber industry is the fact that its defense business declined in 1953 to 12½ percent of total sales. A further decrease to about 10 percent is anticipated this year.

HIGHLIGHT OF THE MONTH



Steel Starts '54 With Moderate Decline

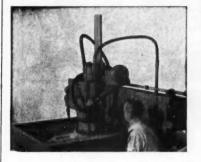
Production of steel in the first quarter of 1954 will probably be about 18 percent short of the mark set during the initial quarter of 1953. Steel producers are feeling the cutback in auto production scheduled for the first months of this year. The chemical industry, as a raw material supplier to both these industries, stands to feel the pinch on both counts.



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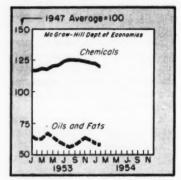
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THIS MONTH'S

Industry

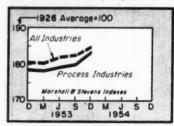
PRICES ...



CHEMICAL PRICES						123.6
OILS & FATS PRICE	S					61.3

	Chemi- cals	Oils &
As of Feb. 1, 1954	123.57	61.28
Last month	123.91	61.36
1 Year ago	117.39	63.69
9 Years ago	190.74	61.76

EQUIPMENT COSTS...



ALL	INDU	STRY	AVER	RAGE.			,	18	4.8	
PRO	CESS	INDU	STRY	AVER	A	GE		18	3.5	

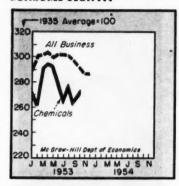
	Sept.	Dec.
Process Industries	1953	1953
Cement mfg	174.3	177.8
Chemical	182.7	186.4
Clay products	169.2	172.6
Glass mfg	172.7	176.2
Paint mfg	176.0	179.5
Paper mfg	176.3	179.8
Petroleum ind	179.4	183.0
Rubber ind	181.8	185.4
Related Industries		
Elec. power equip	184.6	188.3
Mining, milling	183.7	187.4
Refrigerating	203.1	204.9
Steam power	172.3	175.7

Compiled quarterly by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. See Chem-Eng., Nov. 1947, pp. 124-6 for method of obtaining index numbers: March 1954, pp. 214-5 for annual averages since 1913.

Trends

Douglas Greenwald

CONSUMPTION ...

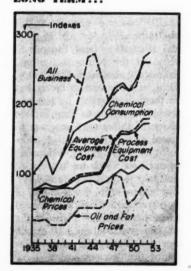


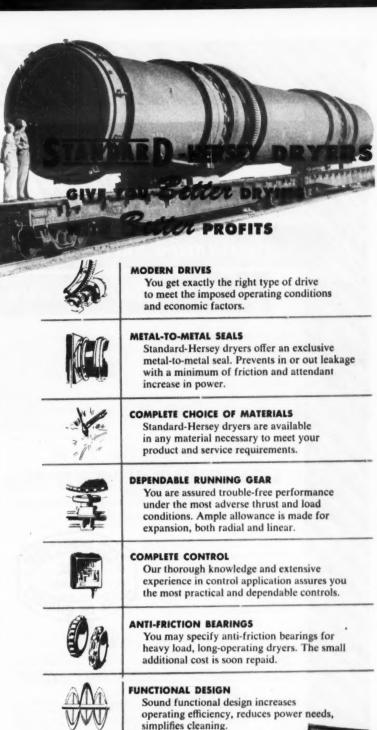
BUSINESS ACTIVITY (Dec.) ... 287.2

CHEMICAL CONSUMPTION

	Nov. (Prelim.)	Oct. (Rev.)
INDEX	253.6	275.3
Fertilizer	52.48	56.17
Pulp & paper	30.98	33.05
Petroleum ref	27.36	27.70
Iron & steel	15.94	17.33
Rayon	23.79	26.55
Glass	22.00	24.96
Paint & varnish	23.69	28.00
Textiles	10.05	10.73
Coal products	11.47	12.01
Leather	3.74	3.98
Explosives	9.10	10.25
Rubber		5.95
Plastics	17.52	18.59

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William J. Sparks

The 1954 Gold Medal of The American Institute of Chemists will be presented to Dr. Sparks at the Institute's annual meeting in May. Dr. Sparks, co-inventor of butyl synthetic rubber and director of the chemical division and coordinator of exploratory research for the Standard Oil Development Co., central research and engineering affiliate of Standard Oil Co. (N. J.), was cited "as an eminent chemist who has striven unceasingly for the promotion of the science of chemistry and the professional advancement of the chemist."

A graduate of the universities of Indiana and Illinois, Dr. Sparks began his career with the Sherwin-Williams Co. Prior to joining Esso in 1936, he was with Du Pont's electrochemicals dept. In 1939 he was selected to head the oil division of the Northern Regional Research Laboratory of the U.S. Dept. of Agriculture at Peoria, but in the following year he was persuaded to return to Esso to take charge of the research program directed at the commercial development of butyl rubber, pioneering research on which he had carried out prior to his departure in 1939. Throughout the development of butyl rubber, Dr. Sparks evidenced a keen interest in all phases of the program and continued to remain optimistic during the critical times during the development.

H. D. Christopher

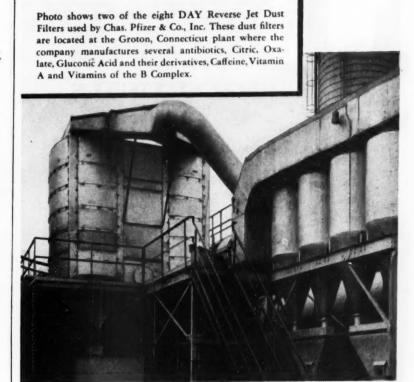
Dr. Sparks has to his credit a variety of inventions ranging from uses for hydrogen peroxide to additives for lubricating oils. He was among the first to foresee the possibilities of high styrene-diene resins produced through the use of the emulsion polymerization process. Throughout his career, Dr. Sparks has combined a remarkable chemical ingenuity with sound economic sense; he has also found time to be active in professional societies, among them the American Institute of Chemists, American Chemical Society, Society of Chemical Industry, American Petroleum Institute, Armed Forces Chemical Association, and Alpha Chi Sigma.

Ernest H. Volwiler. President of Abbott Laboratories has been elected chairman of the ACS board of directors.

William R. Ludka. Director of staff laboratories engineering, Minnesota Mining & Manufacturing, responsible for all engineering connected with 3M's central research and products fabrication departments as well as for new products and defense products departments. He will continue as head of firm's chemical engineering staff.

Robert E. Tanner. Vice president and general manager, Carver Pump Co. Formerly with Continental Can and National Can.

Roy G. Hemminghaus, F. William Koster, William G. Luttge and Frank J. Soday. Elected vice presidents of Chemstrand. Mr. Hemminghaus will continue to be in charge of Chemstrand's nylon plant operations; Mr. Koster will continue in charge of Acrilan manufacturing plant operations; Mr. Luttge will continue as Chemstrand's general sales manager; and Dr. Soday will be director of research and development at firm's multi-unit research center.



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Roslyn K. Gitlin

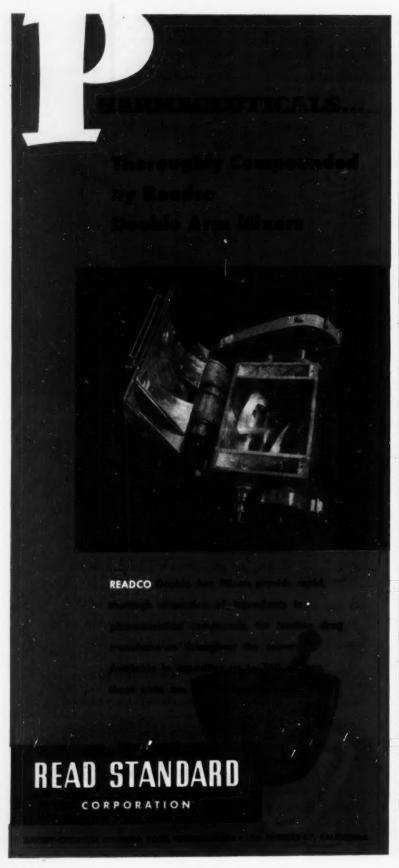
Roslyn Gitlin, editorial assistant on Chemical Engineering, received her Bachelor of Chemical Engineering from C.C.N.Y. and an A.M. in organic chemistry from Columbia. She began her career as an organic chemist in the research department of E. Bilhuber, Inc., Orange, N. J., where she worked on organic syntheses of various intermediates and products including amides, amines, esters, piperazines and tetrazoles.

In 1952 Mrs. Gitlin joined the staff of Alpha Metals, Inc. in Jersey City, N. J., as a chemical engineer in their research and development department. She was responsible for carrying out the quality control program in the plant manufacture of soft solders and did research on new solders.

While an undergraduate of C.C.N.Y., Mrs. Gitlin was an associate editor of Vector, a technical publication. She is a member of the C.C.N.Y. Alumni Association's publications committee, an advisory group for their publication Alumnus. She is also a member of the Board of Directors of the C.C.N.Y. Engineering Alumni.

Mrs. Gitlin is a member of ACS and AAAS and active in the Society of Women Engineers as chairman of the national convention committee, ex-chairman of the Metropolitan N. Y. Section, and present chairman of the section's public relations committee.

Leland F. Johnson. President, California Pennzoil Co. Formerly executive vice president.



- L. L. Garber. Vice president of H. K. Porter elected a director, vice president and general manager of Alloy Metal Wire Co., newly-acquired division of H. K. Porter.
- R. Blavne McCurry. President and a director of Schenley Laboratories. Formerly with Abbott Laboratories.
- Frank H. Conover, Harold B. Coulter, John D. Grothe, Douglas C. Reybold, and Elliott J. Roberts. Elected vice presidents of Dorr Co. Mr. Conover is manager of the procurement and production dept.; Mr. Coulter is head of the mechanical engineering dept.; Mr. Grothe manages the consulting engineering dept.; Mr. Reybold is controller and director; and Dr. Roberts is Dorr's technical director in charge of research, development and the Westport Mill.
- W. Randle Mitchell and H. Merrill Bowman. Elected vice presidents of American Pulley. Mr. Mitchell is the company's controller and Mr. Bowman is in charge of sales and advertising.
- Herman R. Thies. General manager of all chemical products, Goodyear Tire & Rubber Co. With company since 1930, most recently as manager of Goodvear's chemical div.
- Raymond A. Erickson. Supervisor of chemical engineering at Armour Research Foundation of Illinois Institute of Technology. Formerly with Great Lakes Carbon, Ebasco Services, Standard Oil of Calif., and Southern California Gas.
- Frank H. Dickey. Chemistry instructor at U. of California joined Continental Oil as consultant in theoretical research.
- Harold E. Collins. Vice president, Metals Distintegrating Co. With company since 1946, most recently as sales manager of pigments division.



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NAMES . . .

George Edward Holbrook. Assistant director of Du Pont's development dept. received the A.I.Ch.E.'s Professional Progress Award for "his remarkable record as a chemical engineer in his successive positions of directing research, development, and plant production of organic chemicals and for his energetic public services in advancing the profession of chemical engineering."

William R. Marshall, Jr. Professor of chemical engineering and associate dean of the College of Engineering at the University of Wisconsin, received the William H. Walker Award from the A.I.Ch.E. for distinguished contribution to chemical engineering literature in the field of drying.

N. H. Collisson and M. F. Meissner.
Vice presidents for operations,
Olin Industries. Mr. Collisson
was formerly general manager of
Olin's cellophane div. Mr. Meissner, with Olin since 1950, will
continue as general manager of
the metals div.

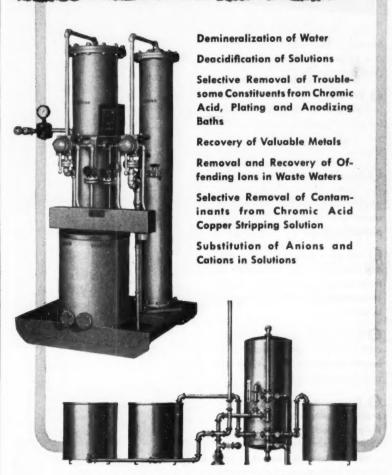
Anton Vittone, Jr. Plant manager of B. F. Goodrich Chemical Co.'s Avon Lake, Ohio, experimental station. Formerly plant manager of company's man-made rubber plant at Institute, W. Va. With company since 1942.

Logan B. Emlet. Manager of production of atomic energy activities in Oak Ridge, Tenn., and Paducah, Ky., operated for AEC by Carbide and Carbon Chemicals Co. In addition to production work at Y-12, the former electro-magnetic separation plant, he will be in charge of the gaseous diffusion plants for production of Uranium 235 at Oak Ridge and Paducah.

Reid G. Fordyce. Director of development and technical service at Monsanto's plastics division. With Monsanto since 1939, most recently as manager of product development in the plastics division.

- James C. Walton. Director of manufacturing of Boston Woven Hose & Rubber, elected chairman of division of rubber chemistry of American Chemical Society.
- W. R. Bateman. Plant manager of B. F. Goodrich Chemical Co., Port Neches, Tex. His successor as production manager: E. E. Mitchell, with company since 1943. Formerly with Texas Co.
- R. L. Hockley. Vice president, Mathieson Chemical Corp. Formerly president of Davison Chemical.
- Lance H. Cooper. Chairman of Mond Nickel Co., Ltd., elected a vice president of parent company, International Nickel Co. of Canada. With company since 1926.
- Hallett B. Addoms. Chief engineer, Niagara Alkali Co. With company since 1945. Previously with Hercules Powder Co.
- W. George Parker. President, Thibaut & Walker Co. Formerly member of board and technical director of Cook & Dunn Paint Corp.
- Charles R. Graham. Director of economic and market research, J. T. Donald & Co. Formerly with Defence Industries Ltd.
- Robert F. Sparrow. Sales manager, Marco Co. With company since 1945.
- Earl C. Lenz. Vice president and general sales manager of Paisley Products, subsidiary of Morningstar, Nicol, Inc., elected vice president of sales and advertising for parent company and all its subsidiaries. With company for 21 years.
- Louis Neuberg. Vice president, sales, Westvaco Chemical Division, Food Machinery and Chemical Corp. appointed vice president of the chemical divisions of the Corp.

PRACTICAL APPLICATIONS OF ION EXCHANGE



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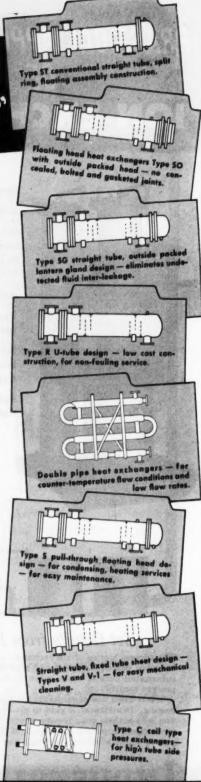
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FRANK S. WARTMAN

Winner of the Department of the Interior's Distinguished Service Award for role in developing titanium process.

"First Titanium Plant Built"
"Titanium Plant Achieves
Commercial Production"
"New Plant to Up
Titanium Output"
"Titanium Output Boosted to
Meet Air Force Needs"
"'Wonder Metal' Output Climbs"
"Titanium Race Steps Up"

These and similar headlines are signposts on the trail which titanium has blazed from yesterday's obscurity to today's multimillion dollar industry.

Headlines, of course, do not tell the whole story. Behind the headlines are men—men such as Frank S. Wartman of Boulder City, Nev., recent recipient of the Department of the Interior's highest honor, the Distinguished Service Award, for his part in the development of a commercial process for titanium.

The award, bestowed in a Washington ceremony attended by Interior Secretary Douglas McKay, marks the zenith of Wartman's 30-yr. career with the Bureau of Mines and is the result of 15-years of pioneering in the technology of titanium.

Currently the head of the Bureau's titanium research station at H. T. Sharp

Boulder City, Wartman began his investigations into the technology of the "wonder metal" in 1938. At that time titanium was virtually unknown.

His investigations, coupled with those of others, both here and abroad, gave an insight into the metallurgical possibilities of the new metal and helped catalyze the Bureau's titanium program. Under his direction, satisfactory titanium was first produced at the Bureau's Salt Lake City station in 1943.

Frank selected the magnesium reduction of titanium tetrachloride as the method most suitable for quick development to tonnage production of high-purity ductile metal. As his citation points out: "He also directed engineering development of laboratory and pilotplant scale necessary to place the process on a practical basis. Industry has substantiated Mr. Wartman's selection of the magnesium reduction process, and it is expected that in the next two years the titanium metal industry will reach a billion dollar per year volume."

Studious, retiring Frank Wartman would be the last to claim major credit for the magnesium reduction process, however, his pioneering investigations and process evaluations were factors in the development of the present process.

When not studying or working on the technology of titanium, Frank Wartman's life is both quiet



Archery is Wartman's favorite hobby.



Problem: To hold I (light intensity) at a constant value when E (voltage) has random variation of \pm 10%

There is obviously no solution to the problem as stated. It follows, then, that where voltage is as critical as in the above formula, untold man-hours of research, test, design, or production may be completely wasted unless E can be accurately controlled.

Whether E or its equivalent in any formula is AC (60-cycle or 400-cycle) or DC, Sorensen electronic regulating equipment is designed to make the results of your work more accurate and your time more fruitful. Instruments are available from stock to fit a very large variety of applications.

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MAGNETIC AMPLIFIER POWER SUPPLIES — These instruments provide regulated DC power at heavy currents. Since they are tubeless, maintenance is at a minimum.

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Literature describing the Sorensen line of electronic power regulating equipment is yours for the asking. Write Sorensen & Co., Inc., 375 Fairfield Avenue, Stamford, Conn. In Europe, write directly to Sorensen A. G., Gartenstrasse 26, Zurich 2, Switzerland.

*Reg. U. S. Pat. Off.

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How the applied knowledge of windspeed and direction, temperature and humidity can help minimize air pollution problems without costly modification of present equipment.

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Then let oil fog smoke escape from ports in the stack near the recording Aerovanes. One day release the smoke from high in the stack . . . then low . . . then from the middle, etc. Next day repeat.

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How to do it

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FRIEZ INSTRUMENT DIVISION OF

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NAMES . . .

and well-ordered. The bulk of his interests are centered about his family, and outside activities are few.

His favorite hobby is archery and whenever he gets the chance he'll set up a target in his backyard and practice. A bit of a craftsman, he makes his own arrows, but finds that he can buy better bows than he makes.

Other pastimes are reading, tinkering with old clocks and following the fortunes of the Boulder City High School athletic teams—a habit he and his wife acquired when the youngest of their two sons starred for the school in three sports.

Harry B. Warner. From plant manager of Avon Lake, Ohio, experimental station to vice president, technical, B. F. Goodrich Chemical Co.

Fred D. Pinotti. Chief engineer and assistant to the general factories manager, elected a vice president and member of the board of Kimble Glass Co., subsidiary of Owens-Illinois Glass Co. With company since 1934.

Murray Berdick. Coordinator of research, Evans Research and Development Corp. Previously with National Bureau of Standards and General Electric.

R. W. McOmie. Manager of Shell Oil Co.'s new refinery now under construction at Anacortes, Wash. His successor as manager of Shell's refinery at Wilmington, Calif.: P. J. Merkus, formerly assistant to the vice president, manufacturing.

William F. Bland. From managing editor to editor of Petroleum Processing, succeeding Virgil B. Guthrie who becomes part-time associate editor. Mr. Bland joined National Petroleum News in 1944 and became engineering editor of Petroleum Processing when it was established in 1946.

Arch Carswell. Vice president in charge of sales, St. Regis Paper Co. With company since 1928, most recently as vice president in charge of sales of multiwall packaging division.

Phillip W. Mettling. Vice president and general sales manager, C. Lee Cook Mfg. Co. Formerly with Cooper-Bessemer Corp.

Earle A. Channer. General sales manager, H. M. Harper Co. With company since 1939.

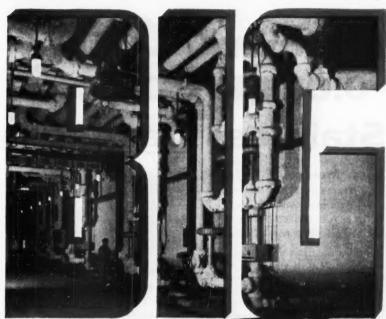


Raphael Katzen

The former manager of the Vulcan Engineering Division of Vulcan Copper & Supply Co. of Cincinnati has opened an office as a Consulting Chemical Engineer at 3735 Dogwood Lane, Cincinnati 13, Ohio. Dr. Katzen's services in the fields of organic chemicals, petrochemicals, wood chemicals and waste disposal will include assistance in management and engineering planning of new projects and improvement of existing processes and installations. He will continue to serve Vulcan as a Consultant.

A graduate of the Polytechnic Institute of Brooklyn, Dr. Katzen began his carrer as a chemical engineer with Cellutate, Inc. of New York. Following that, he was director of research for the Northwood Chemical Co. of Phelps, Wisc., and technical supervisor in Diamond Alkali's research and development dept. at Painesville, Ohio. His association with Vulcan dates back to 1944.

Dr. Katzen holds membership in the A.I.Ch.E., API, ACS, and TAPPI. (Continued)



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water—as illustrated by the fact that after 75 to 100 concentrations, silica content of the boiler water is still *less than 5 ppm!*

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DATA ON SILICA REMOVAL

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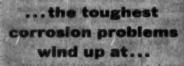
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ESCO 0.03 max. carbon castings can be welded into working position and be ready for action immediately without loss of corrosion resistance. Result: Dependable, corrosionresistant operation. A definite cut in operating costs.

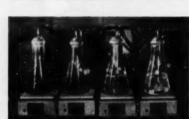
Excellent Welding Characteristics

ESCO 0.03 max. carbon castings may be welded as easily as any 18-8 grade of stainless - without harmful carbide precipitation.



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Extremely close quality control, engineering and metallurgical research and testing, plus foundry skill of the highest order are necessary to produce guaranteed 0.03 max. carbon castings. This same metallurgical and production control is your assurance of unchanging quality and dependability.

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Houston, Texas In Canada, Vancouver, British Columbia and Taranto, Ontario

NAMES . . .

Lee V. Dauler. President, Neville Chemical Co. His successor as vice president; D. W. Kelso, who will continue to serve as treas-

William Johansen. Vice president in charge of sales, Magnesium Company of America. With company since 1948.

Frederick W. Adams. Director of research and development, Millsplastic div., Continental Can. Formerly with Spool Cotton Co., Pittsburgh Plate Glass, and MIT.

Robert J. Wolf. Director of development at B. F. Goodrich Chemical Co.'s Avon Lake, station. experimental Ohio, With company since 1946. New coordinator of technical service: Claude H. Alexander, with company since 1930. New coordinator of product development: Benjamin M. G. Zwicker, with company since 1940.

B. R. Sarchet. Assistant sales manager, Koppers chemical div., succeeding John W. Pool, Jr., named manager of sales development section of Koppers central staff sales dept. Mr. Sarchet's replacement as manager of the Kobuta, Pa., chemical plant of Koppers: Frank R. Garner, former assistant plant manager.

W. R. Jeeves. Vice president and director of overseas operations for Parke, Davis & Co. elected a director. With company since 1927.

John W. Pearson. Executive engineer in charge of engineering research and development, Minnesota Mining & Manufacturing Co. With company since 1939, most recently as director of development engineering for the tape division.

Myrl E. Miller. Manager of process development for engineering planning dept. of chemical research and engineering div.,

Mathieson Chemical. Formerly assistant operations manager at company's Pasadena, Tex., plant. Previously with Ohio State U.

Karl J. Brunings. Director of chemical research and development, Chas. Pfizer & Co. With company since 1948. New director of biochemical research and development: Ernest M. Weber, with company since 1942.

-EAVESDROPPING -



"The construction of pilot plants is not an unmixed blessing."

Sir Christopher Hinton*

Before the war I would very much have doubted the ability of any chemical plant design organization to build satisfactorily plants which were operating entirely new processes without first obtaining experience with pilot plants. (But in the field of atomic energy) it has generally been our experience that plants which we design without waiting for the operation of a pilot plant give less trouble than one would normally expect.

I believe, in the light of my experience over the last six years, that the construction of pilot plants is not an unmixed blessing. There is a tendency for the pilot plant designer to take the line that he need not be too particular in his design because he is, after all, designing only a pilot plant. When the work is picked up by the designer of the full-scale plant, there is a tendency to argue that although the pilot plant looked inelegant, it has at least worked, and therefore it would be unwise to make modifications. If design work is put in hand without the construction of the pilot plant, the designer really has to think for himself and I believe that although in proceeding along such lines one is taking a heavier risk, it usually happens that by taking this risk, better results are achieved.





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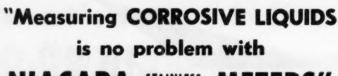
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OFFICES IN LEADING INDUSTRIAL AREAS

^{*} Deputy Controller, Atomic Energy (Production), Ministry of Supply, Great Britain, at National Industrial Conference Board's Second Annual Conference on "Atomic Energy in Industry," New York.



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NAMES . . .



Thomas H. Vaughn

The new vice president in charge of research and development for Colgate-Palmolive Co. in Jersey City recently resigned a similar position at Wyandotte Chemicals Corp. to accept the Colgate-Palmolive post. Dr. Vaughn, a native of Kentucky, was graduated from the University of Notre Dame with degrees of B.S., M.S. and Ph.D. After leaving Notre Dame he helped organize and served as vice president of Vitox Laboratories, Inc., of South Bend, Ind. Later he was director of organic research at Carbide and Carbon Research Laboratories. He was director of organic research for the Michigan Alkali Co., director of research for J. B. Ford Co., and assistant director of research of Michigan Alkali. After these two companies merged into Wyandotte Chemical Corp., Dr. Vaughn became assistant director of research, director of research, and finally vice president in charge of research and development.

Dr. Vaughn is active in a number of technical organizations and has served as an officer of the American Chemical Society, the American Institute of Chemical Engineers and the Industrial Research Institute. He was a member of the five-man Mutual Security Administration Mission which was sent to Europe in 1952.

George L. Cunningham. To head a group of technologists at Southwest Research Institute who are working toward the advancement of the science and technology of inorganic chemistry and inorganic chemical manufacturing. Dr. Cunningham was formerly with the applied science laboratory of the U. of Cincinnati. Previously with Pittsburgh Plate Glass, Diamond Alkali, Allied Chemical & Dye, and Commonwealth Engineering Co. of Dayton.

Philip F. Grieger. Head of chemical research group at Edison Laboratory, West Orange, N. J. Most recently a postdoctoral fellow at U. of Illinois. Previously an instructor at Brown U. and engaged in chemical research for Tennessee Eastman.

Maurice E. Bailey. Group leader in charge of research and development concerned with raw materials for polymers utilized in fibers, resins and rubber, National Aniline Division of Allied Chemical & Dye. New group leader in charge of company's research on synthetic detergents and surfactants: Cecil A. Friedman.

Ross M. Sims. Superintendent of National Aniline Division of Allied Chemical & Dye Corp.'s new plant at Moundsville, W. Va. Formerly at Ensley Plant of Allied's Semet-Solvay division and National's Buffalo plant. New chief chemist: Burnett G. Firstenberger, at National's Buffalo Plant for past 11 years.

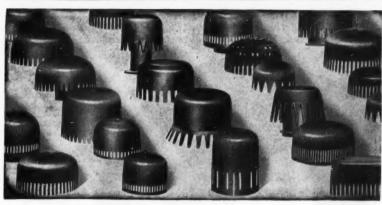
Charles E. Bonine. Manager, chemical product sales, Atlantic Refining Co. With company since 1941.

Percy L. Julian. President and director, Suburban Chemical Co. Formerly with Glidden Co.

William H. Newton. General sales manager, Wemco division, Western Machinery Co. Formerly with Jeffery Manufacturing Co.

Robert M. Moore. Vice president, sales, Pittsburgh Coke & Chemical Co. With company since 1942, most recently as general manager, sales.





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BUBBLE CAP BULLETIN 21

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NAMES . . .

- V. L. Montgomery. Vice president in charge of production, Clorox Chemical Co. With company since 1939, most recently as general production manager.
- William H. Brandes. President of California Ink Co., succeeding C. M. Reed, named chairman of the board. New vice president in charge of sales: Paul Derby.
- Paul L. Weller. Manager of market research, Spencer Chemical Co. Formerly with Wyandotte Chemicals Corp. and Goodyear Tire and Rubber.
- J. B. Bonny. Elected chairman of the board of H. K. Ferguson Co. His successor as president: O. F. Sieder, formerly executive vice president and general manager.

OBITUARIES



Emil Heuser

Research associate emeritus of The Institute of Paper Chemistry and internationally known for his work in the field of cellulose chemistry, Dr. Heuser died December 24 at the age of 71 at his home in La Jolla, Calif.

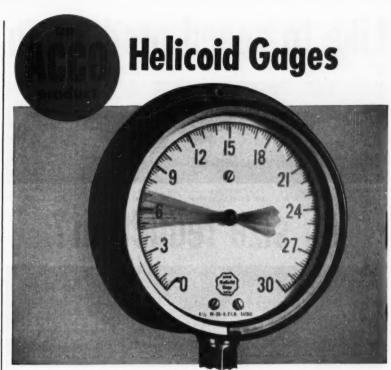
His interest in the manufacture of pulp and paper dates back to his youth in Stralsund, Germany, where his father was technical and commercial director of a mill which converted paper into playing cards. He studied at the Technical University of Munich and at Karlsruhe and at the University at Graz in Styria, Austria. His early practical

experience was obtained in mills at Wurttemberg, Pomerania, Zehlendorf, and Stevrermuhl, Austria, before accepting a professorship at the Technical University at Darmstadt. During World War I he was chief chemist at a government pilot plant at Mannheim for the production of cattle fodder and industrial alcohol from cellulose material. He returned to Darmstadt after the armistice and in 1921 published his Lehrbuch der Cellulosechemie. Dr. Heuser founded Cellulosechemie in 1920 and remained its editor until 1926. During that period he was also editor of the technical section of Der Papierfabrikant. Leaving Darmstadt in 1923, he became research director at the Institute of the Vereinigte Glanzstoff Akt.,-Ges., a large rayon concern in Seehof near

Dr. Heuser left Germany in 1926 to establish and direct a research department for the Canadian International Paper Co. in Hawkesbury, Ontario. In 1938 he joined The Institute of Paper Chemistry as a research associate and group leader in charge of cellulose chemistry. His book on "The Chemistry of Cellulose" was published in 1944, three years before he retired.

In 1948 he received the TAPPI medal for his many contributions to the industry and in 1952 the Alexander Mitscherlich Denkumunze commemorative medal, the highest award given by the German Association of Pulp and Paper Chemists and Engineers in which he had been very active.

- A. Van der Zweip, 70, former gencral insurance supervisor for Crown Zellerbach Corp., died December 5 in San Francisco, Calif.
- William E. Fagan, 69, vice president of the Mutual Liquid Gas & Equipment Co., Inglewood, Calif., died December 12.
- Ames Bartlett Hettrick, 49, assistant manager of American Cyanamid Co.'s newly-formed pigments division, died late in December.

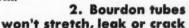


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Only HELICOID Gages offer this long-lasting gage movement. There are no gears, no teeth to wear out. Cam wiping action keeps contact points clean and smooth.



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for Pressure, Vacuum or Compound Service
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flush and panel mountings for flangeless cases.
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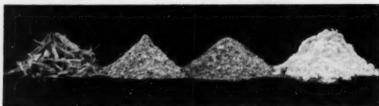




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Equipment for the food and chemical process industries

THIS MONTH'S

Letters:



Liquid-Liquid Extractor?

Would you send me more information . . . on the unusual liquid-liquid extractor (see cut) described on p. 286 of your January issue?

This new unit interests me because of the simplicity it brings to multi-stage liquid-liquid extraction. Particularly interesting is the compactness of the commercial units (you say that actual height of 20 extraction stages is only about 3 ft.) in pharmaceutical and fine chemical operations.

From the photographs you published, I gather that each tray in the column operates as a pair of mix-and-settle stages with sampling cocks on individual stages. Is this correct . . .?

RENE SEVIER

Process Engineer Montreal, Canada

► Yes, that's correct as the photograph above shows quite clearly. In addition, there are separate passages between each pair of stages for the heating or cooling medium.

This story, the first detailed description of the new development, has stirred up unusual interest. Readers wishing further information should contact National Research Corp. in Cambridge, Mass., licensee of the unit. Development work was sponsored by Standard Oil Development Co.—En.

Pro & Con

Technical Literature

Sir.

Just thought I'd write you a note to let you know that I, for one, appreciate very much the extensive listings of Technical Literature you carry every month in your Reader Service section. I've tried them all, but this one is the best yet. It's far more comprehensive, therefore more useful, than similar listings in most other publications.

I have one gripe: Isn't there some way to classify the listings (by types of equipment, for instance) so that they could be checked more easily for those items of major interest to particular individuals?

WILFRED R. CROWDER Chemical Engineer Syracuse, N. Y.

► Reader Crowder's tip is a sound one. Acting on it, we're starting (with this issue) a new system to classify all Technical Literature listings into half a dozen or so broad categories. This will make the section easier to use, hence more useful.—ED.

Pro: New Ed-Ad Format

Sir:

An orchid to you! Which prize is earned by the new layout of CE.

Did you ever travel over many miles of rutted country road and suddenly emerge onto a paved highway?

Wasn't it a grand and glorious feeling?

C. O. SANDSTROM

Engineer Los Angeles 4, Calif.

► This letter, and the three that follow, comment on the new format put into effect with our January issue.

This change greatly reduces the mixing of ads and editorial on the same page, thus is in sharp contrast to the prevalent trend in most publications (and to CE's own past practice). It makes CE easier to read, to use and to save.—ED.

Sir:

You have my congratulations and hearty support on the new layout you've adopted for Chemical





With ATLAS NEELIUM, you apply individual coats as much as twenty mils thick. You use the same amount of NEELIUM as other materials, but it takes considerably less time . . . considerably less labor . . . for a more resistant coating of equal thickness.

Here is the sensible approach to a better protective coating at a lower overall cost. Neelium cuts labor expense which usually runs 3 to 5 times the cost of good coating materials.

NEELIUM is an ideal coating both chemically and physically. It is Neoprene based, and provides a surface that is inert and impervious to an extremely broad range of corrosives in the form of fume or splash. It resists acids, alkalies, oils, greases, salts, sunlight and weathering. Neelium cures at room temperature to a tough, resilient film with remarkable abrasion resistance, assuring long service under the hardest conditions.

Write for full information. Request Bulletin 7-55E.

ATLAS PRODUCTS STAND
... between your process and corrosion



Corrosion-proof: Cements . Coatings . Vessel Linings . AMPCOFLEX®

PRO & CON . . .

Engineering. It's a vast improvement over your past practice of trying to force us to read both advertisements and editorials by mixing them on the same page, thus "stringing out" the editorial.

This change has made CE more useful and much easier to read. Let's all hope other magazines will follow your example.

J. J. RYERSON Development Engineer S. Charleston, W. Va.

Sir:

This is just a note to tell you that I found your January issue of Chemical Engineering most impressive.

It was a well-balanced edition. Anyone in the chemical field would find information of value in it. The information was well organized and easy to locate. I particularly liked the summary on "New Plants and Facilities Under Way in 1953."

I believe you people are to be congratulated for the fine service that you are rendering the chemical industry.

LAWRENCE FLETT National Aniline Div. Allied Chemical & Dye Corp. New York, N. Y.

Sir

A note to tell you I like your move to get away from excessive mixing of ads and articles on the same page. . . .

ARTHUR PINKUS

Denver, Colo.

Sir

My thanks for making the many changes in Chemical Engineering over the past few years. They have resulted in a constant improvement, as I have already mentioned on the "article interest" questionnaires you sent out.

The best of all is the new layout or arrangement of editorial departments and ads that keeps these from being mixed together on the same page. How I love you for that!

CHARLES M. SMITH Chemical Engineer E. I. du Pont de Nemours & Co. Claymont, Del.

378

Process Piping

Sir:

Please allow me to compliment you on the excellence of your report entitled "Process Piping" in the December issue of Chemical Engineering (pp. 187-210).

You have done an excellent and in condensing a complex and far flung subject into concise and readable language without any sacribce of the essentials.

I was particularly impressed by your statement "surprisingly enough, the chemical engineering student leaves school for industry with very little knowledge of this class of equipment." I suppose I was impressed mostly because I had used similar expressions of my thoughts for so many years; as one works in this field he begins to realize that even the knowledge he has obtained over years of experience covers only a small part of the field.

I was also impressed because you have been the first one to recognize in a reputable publication that control valves are a very important part today—both moneywise and engineering-wise — of process piping. . . .

R. B. WEREY

President Conoflow Corp. Philadelphia, Pa.

► Says Ted Olive, author of this popular 24-page report on Process Piping: "Next time I'll write a book; it'd be a lot easier." He probably will, too.—ED.

Right-Way Corrigan

Sir:

As far as we're concerned, Tommy Corrigan can have a green light on his CE Refresher series! J. M. LECOMPTE

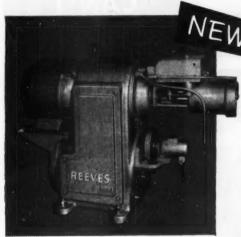
Engineering Dept. Panelyte Division St. Regis Paper Co. (Canada), Ltd. St. Jean, Quebec

► From the reaction we've had, seems like Corrigan has the green light from 95 percent or more of all our readers. So far, we've received only one—yes, one—red-light reaction!

Reprints are now available for those who may have missed the series on thermodynamics (which began in Sep-

You're <u>automatically</u> right with

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CONOFLOW—for automatically controlling liquid levels in tanks, maintaining constant temperatures, pressure and other variables, and monitoring flow systems of liquids, gases or chemicals with linear output speeds.



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PIPE is specified. Available in either
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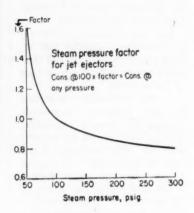
Boy City * Michigan

Manufacturers at Il and Lined Steel, Safan Ruh

Account Steel, Stanley Steel and Manuf Pin

PRO & CON . . .

tember and ran through November) or the series on compression-expansion (which began in December and ran through February). The price is 50 cents for each series.—ED.



Steam for Jets

Sir:

The authors of your January article entitled "How to Check Your Jet Utilities" on pp. 161-164 are to be commended for passing along their valuable data. It is by far the most extensive that I have seen on the subject, and the most practical, too.

You may like to know that I have already found use for the steam-pressure chart (see above) that appeared in the article . . . and I expect more of the data to come in handy soon.

N. E. GARDNER

Food Technologist Stockton, Calif.

► The article mentioned gave 104 sets of consumption data for the steam and water needs of ejectors. It was compiled by engineers at U. S. Industrial Chemicals Co.—ED.

Don't Waste 4.9 Years

Sir:

Here are several thoughts I'd like to pass along to all your prospective authors:

(1) When equations are given in an article, make sure to state just what each symbol represents; (2) if the symbol is clearly defined, be certain that the units are stated for each symbol—such as lb. per sq. ft., ft. per sec., etc.; (3) make certain that your examples are clear,

require little reading time and show how to apply what you have discussed. These three items, when used in an example problem, greatly simplify what the author wants to clarify.

I'm sure there have been many occasions when parts of a technical article or textbook have been difficult to understand. The author then inserts an example to clarify his point. But by failing to use units and to show clearly where each term or constant came from, the reader is forced to waste perhaps a half hour or hour just trying to figure out the example which was inserted to help rather than hinder him. I have had that experience, and many others have commented on having the same difficulties from time to time.

Perhaps this common failure to clearly define terms, symbols, etc., and to show all units may be simply because many authors fail to keep in mind that their readers may range in educational levels from Ph.D's. to college students and have backgrounds which differ considerably from those of their own.

On the other hand, I do not infer that one should write an eighthgrade article in first-grade language. NYM K. SEWARD

Pittsburgh, Pa.

► Look at it this way. Suppose you write an article that, for the sake of argument, is of interest and value to each of CE's 39,000 subscribers. But suppose one of your examples is ambiguous and that each of those readers is forced to spend 15 min.—which isn't much time, after all—just trying to figure out exactly what you did mean.

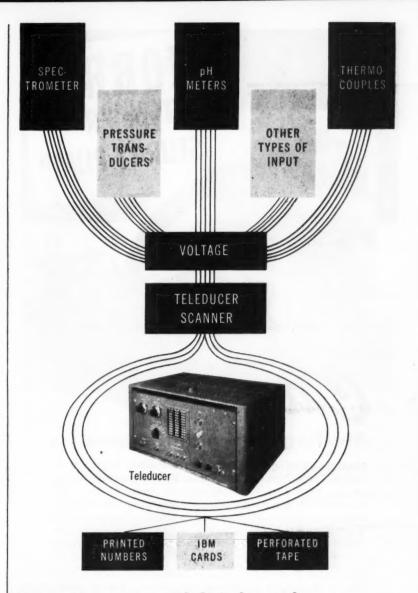
It's shocking, but your (and our) negligence means that 9,750 engineering man-hours went down the drain. To put it another way: We've wasted the equivalent of 4.9 work-years of some chemical engineer!

You as authors and we as editors must bear the full brunt of that responsibility. It's a sobering thought.—Ed.

About Casters

Sir:

I cannot agree with R. L. Miller's article, What You Should Know About Casters for Materials



Automatic scanner and digital recorder...

The new Teleducer Scanning System eliminates high labor costs and human errors from scanning and recording. It gives you accuracy of 0.1%, speeds as fast as one recording operation per second, and readout in decimal numbers.

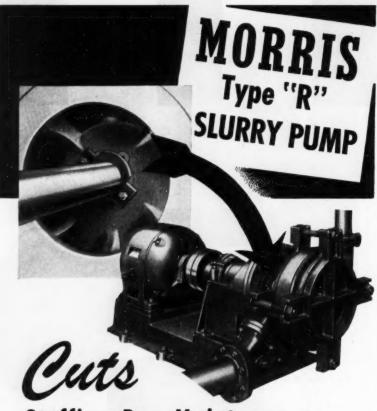
One Teleducer Scanning System handles from one to 100 channels of input from various sources, reads out in printed numbers, punched cards or perforated tape.

Scanning and recording can be continuous or intermittent, depending on your need.

Specifications will be sent you upon request. Please address inquiries to Preston W. Simms, Dept. CE-3.

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Stuffing Box Maintenance...

Fluctuating Sealing Water Pressure Is No Problem when you install a Morris Type R Slurry Pump. Even when peak demand on the plant supply line lowers the pressure, this pump operates with minimum stuffing box wear. Only 10% normal sealing water pressure is actually required . . . because Morris Type R stuffing box is subject to suction pressures only. Low line pressure is therefore sufficient to shut out grit effectively . . . and still protect the slurry from objectionable dilution.

If no other Type R feature were listed, here's one that says: Specify Morris. But there's even a bigger story. Ask for further information of this outstanding slurry pump, servicing scores of material handling applications.

OTHER MORRIS TYPE R FEATURES

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RRIS Centrifugal Pumps

PRO & CON . .

Handling, in the August Plant Notebook. Such differences of opinion indicate that materials handling is still very much of an

Miller advocates a truck with four rigid wheels, two at the centers of the ends and two at the centers of the opposite sides. This arrangement is almost as unstable as a type of three-wheeled truck we formerly used for moving rolls of plastic-coated cloth up to 700 lb. in weight. This had two rigid wheels at one end, a single swivel at the other. In loading and unloading the rolls many accidents occurred: the truck tipped over the swivel wheel.

Now we use a four-wheeled truck with two rigid wheels at one end and two swivels at the other. These have had no tipping accidents. The rocking feature of Miller's truck can be obtained safely by a design similar to his, but with two swivel casters at each end-a total of six wheels. Where we handle loads that don't overhang the truck, we use a four-wheel type with a single swivel at each end and two rigid wheels in the middle.

Again, I am in disagreement on the type of wheel. Miller finds that steel wheels roll easier than rubber or plastic; our experience has been the reverse. In fact, we replaced several hundred metal wheels with rubber (mainly 8-in molded rubber) with a total loading, including the truck, of 500 to 800 lb. on four wheels.

Only on a portable elevator did we go back to steel wheels because of hard pushing with rubber. With the elevator loaded, the load was too great, showing that Miller is right if the load is great, whereas rubber gives a lower rolling resistance for light or medium loads.

I think the reason for this is clear. With a light load the particles of grit which would impede a steel wheel simply push into a rubber wheel. With heavier loads a steel wheel crushes the particles, but a rubber wheel deforms enough to make rolling difficult.

Miller is correct in saying that steel wheels are harder on floors.

Much of our concrete flooring was pitted while we still used steel wheels. Now the pits have been filled with a resilient asphaltic compound which is not damaged by the rubber wheels. Incidently, rubber pushes more easily over a damaged floor. But I question the economy in most cases of putting the resilient material on the floor, and the hard material on the wheels.

Finally, we've never encountered the development of flat spots on rubber wheels, as Miller claims oc curs on long standing under load. Here again this seems to be a function of the load.

RICHARD LEBARON BOWEN, JR.
President and Treasurer
Coated Textile Mills, Inc.
Pawtucket, R. I.
For Mr. Miller's answer to these

comments, see the letter below.-ED.

More About Casters

Sir.

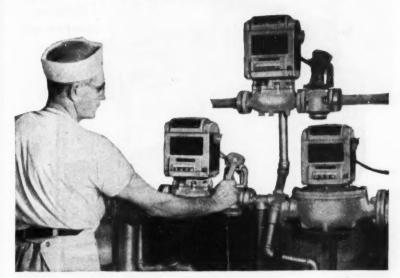
Mr. Bowen and I have no basic disagreement. As for the danger of tipping a loaded truck, it's elementary that the load itself be designed to center on the truck.

Bowen's rolls adhere to this principle except during loading and unloading, when the trouble evidently occurs. He would do well to use a six-wheel tipping dolly such as he describes, but with all rigid wheels. I've moved tanks of 2 tons or more, 5 ft. in diameter and 10 ft. long, on a 1½ x 2 ft. dolly. Since two side wheels are always on the floor (and always in line) they resist tipping. Where they haven't gone to lift trucks, the paper industry moves its newsprint on such dollies.

The lift truck uses Bowen's principle (two rigid, two swivel, on corners). For a short dolly or box it is almost as good as the system I noted (p. 199, Aug. 1954, sketch a,) but don't put it on a box over 6 ft. long if you want to get around corners.

Nor is there any argument about rubber wheels. Bowen's load of 200 lb. or less per wheel is about 40 percent of the rated load according to the leading manufacturers.

Three Neptune Meters Boost Production 200%



Less than half a minute of a man's time is required to measure three ingredients . . . corn syrup, liquid sugar, and water . . . into each batch of Nalley's table syrup. The operator simply pushes buttons on the Neptune Auto-Stop meters to set the pounds required by the formula, and opens the valves. The Auto-Stops shut off automatically . . . accurately . . . leaving the operator free to devote full attention to other details.

One man now produces more than three times as much as formerly was produced by five men handling bulk sugar and barreled corn syrup.

Ask for helpful Meter Selection Book 566S



This Auto-Stop batching meter is only one of many models and sizes of Neptune meters . . . ranging from meters with simple counters to electric switch adaptations and remote control systems . . . now handling more than 150 different industrial liquids. Sizes from 25 to 1000 gpm. Bronze construction. Telephone or write nearest branch for full details.

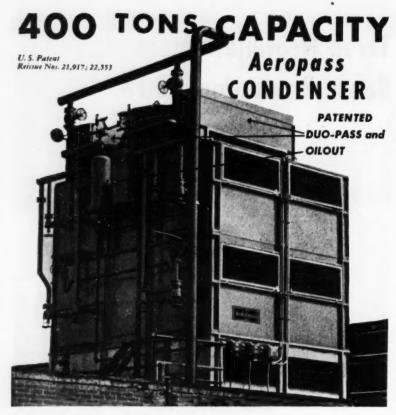
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For large refrigeration systems, NIAGARA gives you a choice between a battery of condensers (that may be cut on or off with the load) or a high capacity condenser that saves space.

Both have the patented "Duo-Pass" and "Oilout" that remove superheat and keep the system free of oil. Results: you save one-third or more of power cost and upkeep expense. Niagara Patented Balanced Wet Bulb Control gives lowest head pressure operation automatically. Write for Bulletin 111.

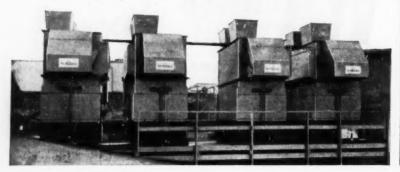
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New York 17, N. Y.

Field Engineers in Principal Cities of U.S. and Canada



PRO & CON . . .

While I pointed out that the use of larger wheels is advantageous, the men who pay my bills object to a 40 percent loading. The same size steel wheel is listed for 1,500 lb. But steel will cut floors, while rubber won't.

I'm sorry if I gave the impression that a trend toward resilient floors is widespread. It is not, though some plants are doing it. Overall costs are still the controlling factor.

ROBERT L. MILLER Northern Ohio Engineering Co. Barberton, Ohio

Heat Transfer in Tubes

Sir:

In your December issue, pp. 174-176, Y. S. Tang's article on Heat Transfer Coefficients for Heating or Cooling in Tubes offers a nomographic solution for this problem.

I should like to direct the author's attention to the validity of his assumption that "for most fluids it (the viscosity ratio factor) can be assumed as unity."

With rare exceptions, turbulent flow inside tubes is restricted to relatively non-viscous media, with dynamic viscosities in the neighborhood of 4 c. p. or less. Under these conditions, the error in ignoring $\phi = (\mu/\mu_w)^{8.16}$ is negligible.

In the viscous region (and to a lesser extent in the transitional region of flow) this assumption breaks down completely for most liquids. This error is aggravated with increasing temperature spreads and with increasing viscosity. The 3rd edition of TEMA (Standards of Tubular Exchanger Manufacturers' Association-1952), p. 88, gives the range of experimentally investigated values of (μ/μ_{Ψ}) as 0.004 to 15. Thus with $\phi = 15^{\circ.14}$ = 1.46 (a situation that could arise even with Tang's relatively low upper limit of $\mu = 100$ lb. per (hr.ft.), an error of 46 percent in the value of h, would result!

By way of emphasizing this point, an inspection of the Sieder-Tate equation in the viscous flow region shows that the coefficient, h_t , is independent of dynamic viscosity μ as such, varying directly

as the viscosity ratio function, ...

Tang's nomogram, if properly qualified, can be applied here. From the foregoing remarks, it is clear that the qualification has to include an allowance for ϕ . This could be done most simply by designating the scale for h_i as h_i/ϕ and subsequently correcting for φ .

While heat transfer engineers will no doubt continue using the TEMA standards, Mr. Tang is to be commended for his nomogram. It should appeal to the average chemical engineer who, while not specializing in heat transfer, still needs a "quickie" solution to this type of problem.

A. DEVORE

Heat Transfer Engineer Davis Engineering Corp. Elizabeth, N. J.

▶For Engineer Tang's answer, see the letter that follows.—En.

Heat Transfer Nomograph

Sir:

I appreciate Mr. Devore's comment on my nomogram and agree that under conditions where ϕ is not near unity, a correction should be made.

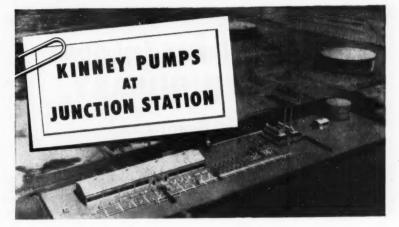
My article called attention to the existence of the viscosity factor $(\mu/\mu_{\Psi})^{0.14}$ and pointed out that it was assumed as unity and neglected only for the sake of simplicity. However, for viscous liquids of high viscosity index the user will need to use as a correction factor the correct viscosity ratio.

The usual procedure will require an estimation of h_i before such a factor can be determined, which can then be corrected in the manner suggested by Mr. Devore.

Y. S. TANG

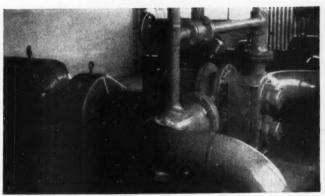
Chemical Engineer Gloucester, N. J.

We welcome short, pertinent letters from our readers giving their opinions on developments in the chemical engineering profession and in the chemical process industries. Address the Editor, Chemical Engineering, 330 West 42nd Street, New York 36, N. Y.



The West's most modern pumping station — Union Oil Company of California's Junction Station — uses the world's most dependable pumps — Kinney Model HQA Heliquad Rotary Pumps. These smooth-pumping units contribute their part to the over-all smooth operation of this up-to-the-minute pumping station.

For positive displacement pumping at its best, whether the viscosity is high or low, it pays to pick Kinney Heliquads. Available in iron, steel, or bronze constructions, with displacements from 20 to 2700 GPM — for pressures from 50 to 300 psig depending upon type of liquid and size of pump. Send for complete details. Kinney Mfg. Division, Boston 30, Mass. Representatives in principal cities of the United States and foreign countries.



Close-up of Kinney Model HQA Heliquad Rotary Pump at Junction Station showing main pump line, manually operated by-pass, and automatic, pressure-relief by-pass.

Kinney Pumps furnished complete with bases, motors, and gear reduction units.



KINNEY MFG. DIVISION

3881 WASNINGTON STREET - BOSTON 30 - MASS.

Please send Bulletin L-51 describing complete line of Kinney Rotary Liquid Pumps.

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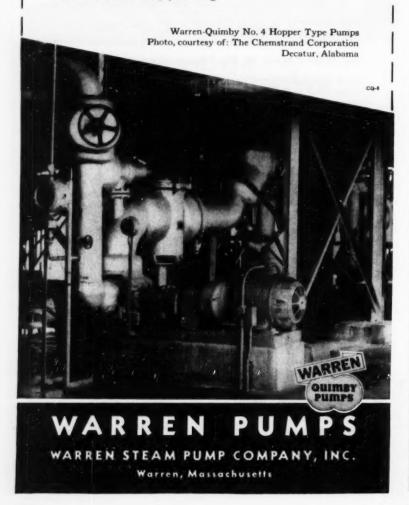
Preferred for Unusual Applications WARREN-QUIMBY

Double External Bearing and Gear Hopper Type Pump

Essentially a unit for handling the most viscous liquids which barely flow and also preferred where it is desirable to mount the pump directly below a tank. This pump is widely used for handling acetates, dopes, tar, soap, sludges, chewing gum, tooth paste, chicle, food products, and where a short, unobstructed suction opening must be provided.

Many applications requiring the filtering of viscous liquids at high pressures up to 1000 P.S.I. are successfully handled with pulseless discharge and without violent agitation or meshing of gears.

Warren-Quimby Hopper Type Pumps are available in stainless steels, acid bronze, nickel and any other machinable metal, in addition to regular cast irons and steels, and with or without body jacketing.



WHAT'S HAPPENING . . (Continued from page 144)

Phillips Almost Doubles Its Output of Ammonia

With the start of operations at its new plant at Adams Terminal on the Houston Ship Channel, Phillips Petroleum Co. has almost doubled its output of anhydrous ammonia. The plant's capacity: 450 tons per day.

A new triple superphosphate plant that can turn out 405 tons per day is also being put in operation at Adams Terminal, and completion of additions at the Dumas, Tex., plant of Phillips will more than double the production of nitric acid for the manufacture of ammonium nitrate there.

The ammonia plant at Adams Terminal will take 26 million cubic feet per day of natural gas from the nearby Chocolate Bayou field, where Phillips has reserves. Adams Terminal also has tidewater port facilities.

Phillips got into the ammonia business in 1948 when it began operating the Cactus ammonia plant in the Texas Panhandle. This plant was expanded, and in 1953 produced over 500 tons per day. Phillips makes ammonium nitrate and nitrogen solutions in additional facilities at the Cactus plant.

U. S. fertilizer consumption has tripled in the past 15 years. It's estimated that from \$2 to \$10 normally are returned for each farm dollar spent for nitrogen fertilizers. That farmers are feeding 50 percent more people in the United States today than in 1920, from fewer acres, is due in large measure to greater productivity made possible by growing use of fertilizers.

Hooker Among Leaders In AIM Survey

Hooker Electrochemical Co. has been certified as "excellently managed" by the American Institute of Management for the fourth consecutive year. President Jackson Martindell of AIM says Hooker is rated in the top half of the 348 companies in the United States and Canada eligible to receive the designation for 1953. These companies were picked from 3,000 whose methods were evaluated.

"Our continuing studies show the cumulative effect of these awards," Martindell declares, adding that they "have helped to introduce new and better policies in the top levels of many business organizations.

"The philosophy behind these awards is to focus attention upon companies whose practices should be emulated by others, to increase efficiency and insure stability for employees, shareholders and the economy as a whole."

The AIM uses a point system for rating 10 key factors in each company: economic function, corporate structure, health of earnings growth, fairness to stockholders, directorate analysis, research and development, fiscal policies, production efficiency, sales vigor and executive evaluation.

Piping for Diffusion Plant Will Cost Over \$3 Million

The U. S. Atomic Energy Commission has called upon Blaw-Knox Co. to turn out another 1,240 tons of prefabricated piping for use in the new gaseous diffusion plant being built at Portsmouth, Ohio, for AEC.

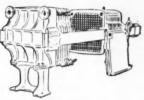
Amounting to \$1,159,061, this is the third piping order received by Blaw-Knox for the Portsmouth diffusion plant. The three awards total over \$3 million and cover 3,040 tons of special piping.

Texas Expansion Completed by Mathieson

Mathieson Chemical Corp. has completed a \$1.5 million expansion at its Pasadena, Tex., plant. Commercial production has just begun in a new \$1.1 million unit for the manufacture of high-analysis pelletized ammonium phosphate fertilizer. The new unit will increase Mathieson's production at Pasadena by 25 percent.

Modifications of the existing sulfuric acid plant and fertilizer plant

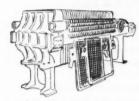




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WHAT'S HAPPENING . . .

at Pasadena, costing more than \$400,000, have recently been completed. This expansion, according to Mathieson, provides the Houston area with the largest chemical fertilizer plant in the Southwest and one of the largest in the nation.

The present expansion continues a policy of development at Houston that began when Mathieson acquired the Pasadena sulfuric acid and fertilizer plants in 1949. The operations consume large quantities of sulfur mined in the Houston area.

Certain process improvements have been incorporated in the new fertilizer unit. Construction of the unit began in January 1953.

Byproduct Hydrochloric From Potash Refining

First commercial production of hydrochloric acid in New Mexico has been started in a new plant near Carlsbad by International Minerals & Chemical Corp.

The hydrochloric acid comes from what had previously been a waste product. In the process of making potassium sulfate, magnesium chloride had been discarded as waste. In IM&C's new plant this waste is being used to produce the hydrochloric acid and magnesium oxide.

Most of the acid will be used by the oil industry in southeastern New Mexico and west Texas. International Minerals is one of the major companies now mining the huge potash deposits near Carlsbad.

Process Industries Group For Northeastern Ohio

To bring together engineers in the chemical process industries of northeastern Ohio the Cleveland Engineering Society has organized a Process Industries Division.

The new division will make possible discussion of technical subjects not within the scope of the previously existing groups. It will deal with specific problems in the chemical and processing groups.

Preliminary planning for the new

division was done by a long-range planning committee of the Cleveland Engineering Society under the chairmanship of Joseph H. Gepfert of Reeves Pulley Co. An advisory group of 30 representatives of the process industries, headed by C. A. Butler, Jr., director of engineering of Diamond Alkali Co., formulated plans for the new division of the 73-year old engineering organization.

After this advisory group had approved the plans a steering committee including Charles E. Herrstrom, Bosworth, Sessions, Herrstrom & Williams; Carl E. Heil, Heil Process Equipment Corp.; Robert F. Wysocki, Forbes Varnish Co. and C. F. Dunasky, Harshaw Chemical Co., drafted the aims and purposes of the division.

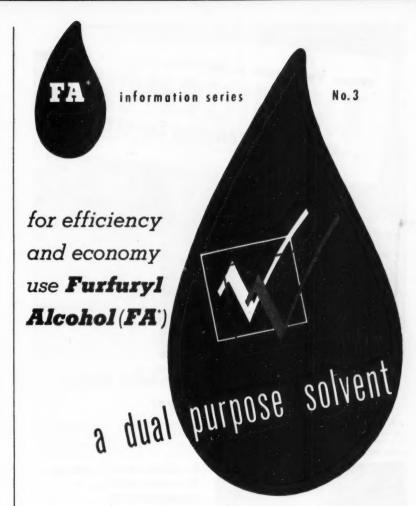
The petition for the formation of the new group was formally presented by Butler of Diamond Alkali, who is a board member of CES. It was approved at a meeting of the board of governors.

The new division is now registering charter members and planning its initial meeting.

Present charter members of the Process Industries Division include: Charles E. Herrstrom; C. C. Brumbaugh, Diamond Alkali Co.; Ernest M. Schiller, General Electric Co.; Ernest R. Brooks, Jr., North American Manufacturing Co.; James R. Longstreet, Warner & Swasey Co.; Carl E. Heil, A. J. McCullough, Minneapolis-Honeywell; C. C. McClelland, Bailey Meter Co.

C. Langdon Campbell, Centrifix Corp.; Carl S. Brown, Glascote Products Co.; Joseph H. Gepfert, John G. Glekler, Ohio Chemical & Manufacturing Co.; C. A. Butler, Jr., C. N. Rill, Franklin Oil & Gas Co.; Harvey L. Lee, Foxboro Co.; Joseph H. Kraft, H. K. Ferguson Co.; Ira Rosin, Cleveland Mixer Co.; Robert E. Dyas, Hupp Corp.; Edward W. Hollis, Parker Appliance Co.

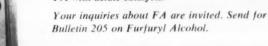
Victor L. Bajc, Dasher Rubber & Chemical Co.; Robert J. Heartz, Jeavons Japanning Co.; E. H. Bellard, Swartwout Co.; John C. Caldwell, Lacquer Products Co.; E. J. Skiba, Brown Fintube Co.; and J. H. Charlesworth, Brown Fintube Co.



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In other cases furfuryl alcohol is a reactive solvent with phenol-aldehyde resins, as for example in the manufacture of resinoid abrasive wheels. Up to 95% of the FA added to the wheel may be reacted. Where FA does not react with a particular resin, similar results may be achieved in the blend by resinifying FA with acidic catalysts.





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WHAT'S HAPPENING . . .

Among non-CES members on the advisory group that urged the formation of the new division were: C.F. Dunasky, Reinhold Joos, C. O. Bartlett & Snow Co.; D. W. Towers, G. M. Miller, G. A. Kostyn and H. Q. Maloney, all of Brown Fintube Co.

Texas Plant Will Produce Natural Gasoline and LPG

A natural gasoline plant to process casinghead gas produced in the West Seminole field of Gaines County, Tex., will be built and operated by Cities Service Oil Co. for a group of oil companies.

The group includes Cities Service as the majority owner, together with Atlantic Refining, Burdell Oil, Magnolia Petroleum, Superior Oil, Sinclair Oil & Gas, Shell Oil and Great Western Drilling Co.

The plant will be located on a 160-acre tract approximately six miles west of Seminole, Tex., and 20 mi. east of Hobbs, N. Mex. It has been designed to gather and process all West Seminole gas and produce 55,000 gal. daily of natural gasoline and liquefied petroleum gas.

Construction is getting under way by Delta Engineering Corp. of Houston. Producers in the West Seminole field look upon the project as an important step in the conservation of natural gas.

Canadian Companies Join U.S. Newcomers in MCA

For the first time in its 82 years of existence, the Manufacturing Chemists' Association has elected two Canadian members, a step made possible by recent revision of MCA's bylaws.

Admission of the two Canadian companies, together with seven U. S. firms, has been approved by MCA's board of directors. The two Canadian companies are Consolidated Mining & Smelting Co. of Canada, Ltd., and Shawinigan Chemicals, Ltd. Both have head-quarters in Montreal.

Newly elected U. S. companies are: Arnold, Hoffman & Co., Inc.,

Providence, R. I.; Godfrey L. Cabot, Inc., Boston, Mass.; National Petro-Chemicals Corp., Tuscola, Ill.; Sinclair Chemicals, Inc., New York, N. Y.; United States Stoneware Co., New York, N. Y.; R. T. Vanderbilt Co., New York, N. Y.; and Western Electrochemical Co., Culver City, Calif.

MCA member firms in the United States, now totaling some 140, account for more than 90 percent of the capacity of the nation's chemical industry.

New Processes for Modified Urea Resins

Commercial processes for manufacturing modified urea-formaldehyde resins have been developed by Sharples Chemicals Inc. of Philadelphia. H. L. Barnebey, consulting chemical engineer of Pittsburgh, Pa., is handling licensing arrangements for Sharples.

One of the modified resins is made from urea, formaldehyde and sugar. It's proposed for adhesives, core binders, treating agents for paper and fabrics, and surface coatings.

Other resins are made from formaldehyde and alkyl or alkylol urea and can be used alone in coating or impregnating compositions, or as additives to achieve particular properties in resin mixtures.

Greater Production Opens New Polyethylene Markets

Production of polyethylene, one of three critical industrial materials still in short supply, is increased 45 percent now that the new Texas City plant of Carbide & Carbon Chemicals Co., is operating at capacity.

"With its production capacity rated at more than 60 million pounds per year, this new plant is the first to come into production of the three new polyethylene plants announced by Bakelite Co. earlier—the largest expansion program in the history of the plastics industry," according to President George C. Miller of Bakelite Co., another division of Union Carbide & Carbon Corp.



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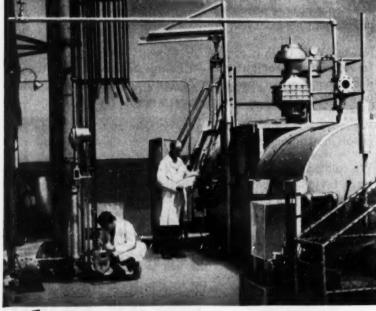
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WHAT'S HAPPENING

lite Co., another division of Union Carbide & Carbon Corp.

In addition to the Texas City plant, two other polyethylene plants are now under way. Like the Texas City plant, they will be built and operated by Carbide & Carbon.

"By mid-1954," Miller declares, "production capacity of Bakelite polyethylene will again be increased as the second plant, rated in excess of 60 million pounds annually, begins operation at Seadrift, Tex. These two new plants together will be producing at a rate in excess of 120 million pounds per year.

"This increased production of Bakelite polyethylene is approximately equal to the entire industry's polyethylene production just one year ago. The third plant at Torrance, Calif., will have a similar capacity and is expected to be in production in 1055

"The list of critical materials in short supply has been narrowed to polyethylene, nickel and some steel items," Miller observes. "When the second of these plants comes into full production in the next six to eight months the shortage of polyethylene will be eased and the way opened for more new fabricators and new applications.

"In line with Bakelite Co.'s longestablished policy of lowering prices, as justified by improved efficiency and increased production, the price of Bakelite polyethylene was recently reduced to 41 c. per lb.," Miller states. "A series of three price decreases in less than 15 months reduced the price of Bakelite polyethylene from 49 c. to 41 c. per lb.

"New uses for polyethylene are being found almost every day and countless others, previously retarded by lack of supply, are expected to follow," Miller predicts. "The new cellular polyethylene as insulation for lead-in wires from UHF television antennae will aid expansion of the television industry. Thin film for food and other types of packaging is improving merchandising and selling. Similarly, the familiar squeezable bottles are encompossing a larger field of use and contents. New types of heavy-duty, corrosion-resistant shipping containers are helping industry. Polyethylene pipe is being more widely used

for farm water supply as well as in mines and factories to resist corrosion. These are but a few examples of how polyethylene is expanding.

"Not only has Bakelite polyethylene had a phenomenal growth curve," Miller adds, "but it has also had the greatest percent price reduction of any major plastic in the last 10 years. Today Bakelite polyethylene sells at a price 59 percent under the 1943 price of \$1 per lb. We cannot predict the exact price for 1955 and 1960, but it is almost certain to be in the 30 c. per lb. range and possibly in the 20s. We will continue our policy of sharing with our customers the savings brought about by this increased production and improved efficiency."



LITTLE BONER

A Spring Bloomer

A small chemical plant was using a process that evolved a mixture of carbon dioxide and hydrogen. The gas mixture could either be vented to the outside atmosphere through a 3-in. horizontal pipe or sent to a gas holder. Two valves were used to direct the flow.

After a rather long shutdown (in early spring) the plant was started up again. But when the vent valve was opened there was no flow of gas through the open line.

One of the engineers was sure there was something wrong with the valve. After all, what else could it be? But his ego was deflated when he dismantled it—to find it in perfect condition.

in perfect condition.

That caused several minutes of awkward confusion among the engineers. Then a young operator calmly picked up a long rod and poked through the vent pipe. Out came a bird's nest with three asphyxiated sparrows.

Engineers at that plant now cover all open pipes with a screen—and have more respect for the operators' advice, too. Send your own true "little boner" to the Editor, Chemical Engineering, 330 W. 42 St., New York 36, N. Y.



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Industrial Location Service of New York State

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THIS MONTH'S

Technical

A Stereotyped Book Review¹

ENCYCLOPEDIA OF CHEMI-CAL TECHNOLOGY, Vol. 11: Polyols to Rutin. Edited by Raymond E. Kirk and D. F. Othmer. Assistant editors: Janet D. Scott and Anthony Standen. Interscience Publishers, New York. 950 pages. Subscription price \$25.

Once again it is our pleasure to bring to your attention another addition to the valuable and growing series on your reference shelf.

The editors' have again called on recognized experts for latest and best data. The entries cover a segment' of current technological practice.

As usual, chemical engineers will find several general survey articles10 that are well done. And again there are entires which are too short" or too long.18

The articles discussing various

FOOTNOTES

1. By the time we come to Vol. 11 of a set of encyclopedias, we have surely said almost everything possible about the series and its value. For this reason-and because there are more volumes to come-we have prepared this standard review for use in these columns. Look for it again in about six months.

2. See Chem. Eng., Feb. 1948, p. 285, for an appraisal of the value of the series.

3. Gestation period is variable; six or seven months.

4. Kirk and Othmer (see Chem. Eng., Feb. 1948, p. 285), Scott and Standen (see Chem. Eng., May 1950, p. 261).

5. Eighty. 6. Sixty-four.

7. Polyols to Rutin on the backstrip. Actual entries range from Polypropy-lene to Rubidium Compounds.

8. Mostly American practice is reported. This accounts in part for the widespread interest and the many orders the publishers receive from other coun-

9. Five.

10. Such as Power Generation, Pressure Technique, Quality Control, In-dustrial Radiography, Refrigeration. 11. Pyroxylin, one-third page. The

shortest signed entry.

12. Rubber Compounding, 54 pages.

13. Three.

L. B. Pope

industry segments14 are-on the whole-adequately presented and about the right length. Whole industries are covered with the usual attention to timeliness, 18 accuracy16 and detail.17

Techniques18 are normally represented in this segment of the alphabet."

A number of the discussions are about arts and sciences" which are of fringe interest to chemical engineers. These are, in some cases, extremely interesting reading."

Of major value are some of the articles in the largest categorygroups or families of compounds.34 These are variable in length as well as intrigues and value and humor.

FOOTNOTES

14. Typical examples: Pulp, Rayon,

Rubber. 15. " . in 1952 the [pulp] production has increased to 706,000 short

16. "These figures are corrected to the nearest integer from the figurers calculated from the raw data, and the error involved in this calculation is probably in no case more than one or two molecules."

"The price of rayon filament has 17 varied considerably since 1911.

18. Such as Potentiometry, Pressure Measurement, Refractometry.

19. Three entries.

20. Four.

21. Powder Metallurgy, Printing and Reproducing, Pyrotechnics (both mili-

tary and commercial).

22. Commercial Pyrotechnics, for ample. "The Chinese houseboat example. dweller starts off his morning by shooting off a bunch of firecrackers to warn all devils that he is awake and on the job, and that they had better keep

23. Twenty-six entries.

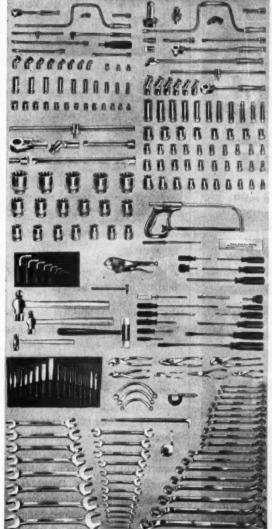
24. Polysaccharides, Potassium Compounds, Printing Ink, Rare Earth Metals, Rosin Derivatives, etc.

25. 3½ pages for Rubidium Compounds; 30¾ pages for Rosin and Rosin Derivatives.

26. "Pyridine is detoxified in the dog by conversion to N-methylpyridium hydroxide."

27. Value depends on the user. The Encyclopedia will usually supply worthwhile help or guidance.

28. "Asafetida is a foul-smelling substance and has been referred to as 'devil's dung'. . . . The benefits accruing from its administration may arise from the mental impression induced by its unpleasant odor and taste.'



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IN CANADA

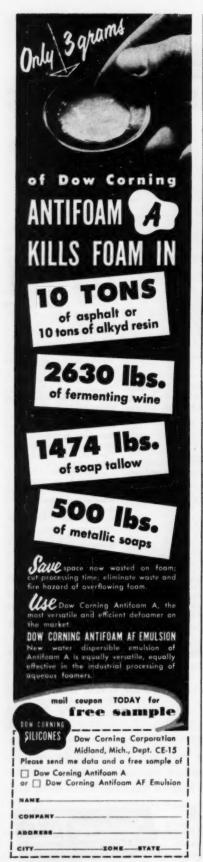
Edmonton, Alta., 23889 London, Ont., 4-7307 Moncton, N. B., 2-4159 Montreal, Que., REgent 3-7179 Regina, Sask., 7170 Terento, Ont., MAyfair 1196 Vancouver, B. C., TAtlow 1561 Winnipeg, Man., 6-5093

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BOOKSHELF . . .

Single chemicals³⁰ are in the minority. But they are usually very well done.

Theory** is adequately covered.**
It is sometimes fascinating to discover facts outside one's own experience.**

One entry⁸⁰ deserves special men-

Reading or thumbing through this latest volume, one discovers strange facts, be learns queer things, so is often amused and is frequently impressed with the erudition of the authors. Pedanticism is, of course, at a minimum.

It is a pleasure to recommend the series as a whole and this volume in particular.—LBP

29. Nine: Propionic Acid, Propylene, Pyridoxime, Pyrocatechol, Pyrogallol, Pyroxylin, Quinoline, Resorcinol. Riboflavin. (See also Footnote 11 above).

30. Radicals, Radiochemistry (also called Hot Atom Chemistry), Raman Effect, Reaction Kinetics, Rheology.

31. Average entry length is 13.8

pages.

32. Such as definitions of Spinnbarkeit and tachypyknosis (see Rheology).

33. Reppe Chemistry (18 pages). The term is used to designate that phase of acetylene chemistry involving the use of acetylene at pressures in excess of 1 atm.

34. "... many industrial products such as shaving cream, ketchup and mayonnaise show... hysteresis loops"

mayonnaise show . . . hysteresis loops."
35. "These firecrackers must be made of, or at least covered with, red paper, as the devils hate and mortally fear the color red."

36. "While the odor of burning myrrh cannot be considered the most attractive, it is not impossible that tastes in odors may have changed with time."

37. ". . . vibratory motion of the atoms around their equilibrium positions is considered to be very small in reference to their distance apart."

reference to their distance apart."

38. "The well-known line from the Star Spangled Banner and the rockets' red glare' refers to the use of rockets

RECENT BOOKS RECEIVED

College Placement Directory. By O. T. Zimmerman & Irvine Lavine. Industrial Research & Service. \$10.75.

Detergency Evaluation and Testing. By J. C. Harris. Interscience. \$3.75. Flow Properties of Disperse Systems.

Interscience. \$9.90.

Heat and Thermodynamics. 4th ed. By
J. K. Roberts & A. R. Miller. Interscience. \$5.50.

Introduction to Chemistry. By R. T. Sanderson. Wiley. \$5.50.

Technical Aspects

MODERN ELECTROPLATING. Edited by Allen G. Gray. John Wiley & Sons, New York. 563 pages. \$8.50.

Reviewed by A. H. Pope

Modern Electroplating, which has long been a standard text for the plating industry, has been brought up to date by the Electrochemical Society. In all, 39 authors have compiled a treatise covering virtually all aspects of commercial electroplating. The list of authors reads like a "Who's Who" of American electroplating engineers.

While the book is addressed to the plating industry in general, it is the reviewer's opinion that those whose interests are highly technical will find the book of most value. The authors are quite concerned with the technical aspects of plating but treat very lightly such matters as metal preparation and equipment.

The text includes chapters on principles and control, followed by 17 chapters covering all commercially electroplated metals.

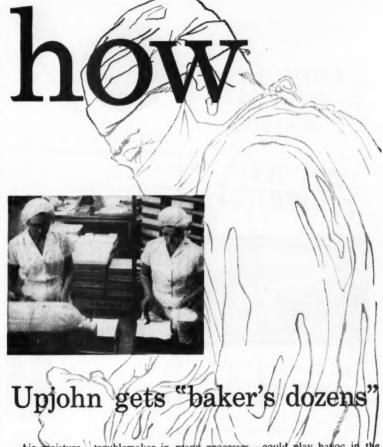
The discussion of each bath is broken down into various phases including function of constituents, bath composition, preparation of basic metals, operating conditions, control, anodes, nature of deposit, etc.

The handling of references is most excellent. There are a large number at the end of each chapter with the usual indexing in the text. These will prove to be of special value to those making comprehensive studies of specific phases of plating.

The sixteen page appendix contains many tables of value but the index has been passed over rather briefly. Such words are cleaning, stainless steel, pickling, racking are absent in the index.

Throughout the book both the C.G.S. and the pounds per gallon figures have been given in discussing bath make-up.

Notwithstanding the omissions mentioned in these comments, "Modern Electroplating" does contain a great quantity of information and is of value to those interested in actual plating operations.



Air moisture—troublemaker in many processes—could play havoc in the processing of "Gelfoam," Upjohn's sponge-like material for the control of bleeding in surgery. Kathabar humidity conditioning holps provide Upjohn with "baker's dozen" production by delivering uniformly dry air to Gelfoam baking ovens—cutting drying time, saving fuel, and maintaining product quality and uniformity.

This is just one of the numerous instances in which Kathabar's direct dehumidification is cutting costs in the chemical process industries. Manufacturers of plastics, petrochemicals, pharmaceuticals, rubber, photographic film, military powders, and many other materials use Kathabar air conditioning for production, packaging and storage. Installations range up to more than one hundred thousand cfm in capacity.

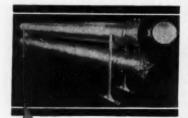
Look into Kathabar humidity conditioning now as a "straight line" to "perfect weather" production every day. Check the literature most pertinent to your problem, attach clipping to your letterhead, and mail.

Kathabar
HUMIDITY CONDITIONING

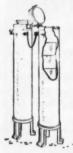
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A DEPENDABLE SOURCE FOR **INERT GAS**

DRY ICE CONVERTERS



No Operating Costs! Easily Cleaned!



Dry Ice Converters are A.S.M.E. code pressure vessels especially adapted to charging with full 50-lb cakes of solid CO2. They may be located any place in a plant, connected by pressure

piping to use area for the gas.

They require no fuel, no electricity, no refrigeration. There are no operating costs! Because they are full opening, they are easily inspected and cleaned. They are ideal for either stand-by or continuous use. A variety of sizes are available for either horizontal or vertical installation.

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DRY ICE CONVERTER CORPORATION

Dept. C., Box 1652, Tulso, Oklo.



A new concrete curing process, being tested by the New Jersey Highway Department, may speed the building of bridges and viaducts. It permits the wooden forms supporting wet concrete to be removed in 60 hours instead of the usual 14 days After the concrete is poured into the forms, 3-foot square mats are laid on top and vacuum hoses are used to draw off excess water. This cures the concrete in a fraction of the time formerly required.



A sinking plant, and what to do about it, was one unusual assignment given Kaiser Engineers. A large area of land on which the tidewater plant was located had sunk six feet in twelve years; the dock loading area had become unusable at high tide. To solve the problem, Kaiser Engineers re-designed the dock area to increase its height and make it serve as a coffer dam to keep the water from affecting the round-the-clock operations of the mill. Tight construction scheduling was a must because of ship traffic and high tides.



problems encountered in the nuclear energy field.



Whatever your immediate research, design or engineering problems, however unusual they may be, an early consultation with Kaiser Engineers is an important step toward their quick, profitable solution. Call or write Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

THIS MONTH'S

Recent Books

Corresion

A report on the corrosive effect of fresh, household sewage on copper tube used as soil stacks for domestic plumbing. 42 pages.

"The Corrosion of Copper Tube Used in Soil Stack Installations." Bulletin No. 419. The Engineering Experiment Station, University of Ilinois, Urbana, Ill. 75 c.

Disaster Plan

Booklet gives a variety of suggestions intended to help in establishing a basic disaster plan for the chemical and allied industries. Outlines internal disaster organizations and gives a check list of duties. 60 pages.

"Emergency and Disas-ter Planning for Chemi-cal and Allied Indus-tries." United States Department of Commerce, Business and Defense Services Administration, Washington 25, D. C.

Industrial Waste Treatment

Booklet sets forth a program for neutralizing industrial wastes and elimination of stream pollution. Describes laboratory and engineering studies that should be undertaken prior to treatment-and methods of treatment of effluents.

"Neutralization of Acidic ents." Manufacturing Chemists' Association and Alkaline Plant Efflu-Association, Woodward 246 Inc. Building, 1625 Eye St., N.W., Washington 6, N.W., DC

German Patents

A digest, in English, of German patent applications. Covers two fields-chemical production of synthetic resins and production of plastic materials.

> "Monthly Digest - Patent Classes 39b and c.' Research Information Service, 53 Nassau St., New York 38, N. Y. By subscription – 6 months \$95, 12 months \$175.

& Pamphlets

Petroleum Tables

A volume of petroleum measurement tables in metric units—completing a trilogy. A volume based on British units and another on U. S. units have been published. 452 pages.

"ASTM-IP Petroleum Measurement Tables. Metric Edition." The Institute of Petroleum, 26 Portland Place, London, W. 1, England. £2, 15s.

Painting Practice

The first of two volumes on painting. Describes the best of the latest practices for preparation and painting of surfaces in numerous industries. Not a technical treatise, but a practical encyclopedia of good painting methods. 432 pages.

"Good Painting Practice." Steel Structures Painting Council, 4400 Fifth Ave., Pittsburgh 13, Pa. \$6.

Plant Growth Substances

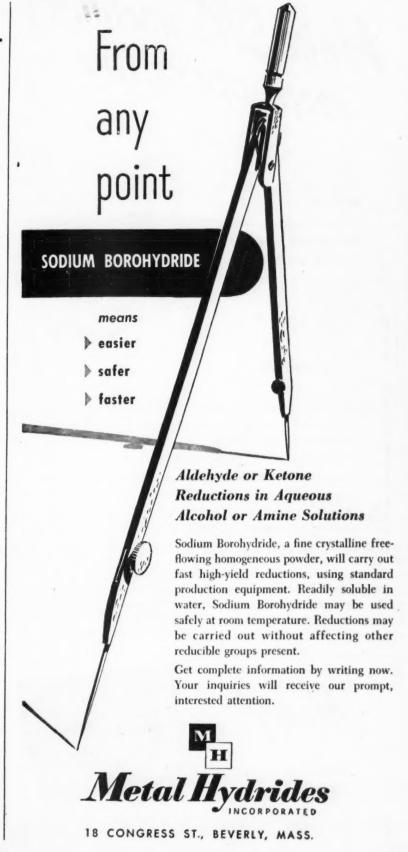
A book which covers the practical aspects of using growth substances. Discusses growth stimulants, growth inhibitors and plant hormones. Written for both the nonscientific layman and the plant physiologist. 465 pages.

"Plant Growth Substances." Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. \$6.50.

Time and Motion Study

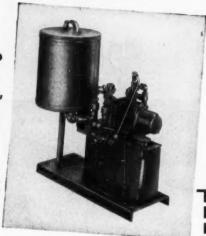
The complete transcripts of talks by top leaders of labor, management and government at the 17th annual Time and Motion Study Management Clinic in Nov. 1953. Charts and illustrations. 168 pages.

"Proceedings of the 17th Annual Time and Motion Study Clinic." Industrial Management Society, 35 East Wacker Drive, Chicago, III. \$4. (End)



Make SURE machinery keeps operating

• For the solution to lubrication difficulties, or chemical feeding problems, more and more companies are turning to Manzel.



...for example:

Chemical Feeders are used throughout the oil industry to keep wells and pipelines in good, flowing condition. *But*, in wet gas fields corrosion frequently stops the motors that power these feeders.

To solve this problem, Manzel developed a chemical feeder with built-in automatic force feed lubrication which protects the gas motor from corrosion and insures continuous operation of the feeder.

For 50 years a leader in the field, Manzel is today a flexible, fastmoving organization with the special technical skill for meeting your needs quickly and economically. Write for further information about Manzel Force Feed Lubricators and Chemical Feeders.

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A DIVISION OF FRONTIER INDUSTRIES, INC.

THIS MONTH'S

Firms in

New Names

Shell Chemical Corp. has changed the name of its Julius Hyman & Co. Div. to the Agricultural Chemicals Div. The Division, located in Denver, will continue to market its usual variety of agricultural chemicals. The name change affects the marketing organization alone.

New Locations



American Chemical Paint Co., Ambler, Pa., has moved its Detroit office to 10225 West Mc-Nichols Rd., Detroit 21. Warehouse stocks of ACP's line of rust-proofing and phosphate coating chemicals will be maintained on the premises.

Manufacturing Chemists' Ass'n., Inc., will move from the Woodward Bldg. to 1625 Eye St., N. W., Washington 6, D. C., in order to provide for its expanding activities.

George Armstrong & Co., Inc., industrial engineering and management consulting firm, has relocated its New York office at 551 Fifth Avenue, New York 17.

National Research Corp., Cambridge, Mass., has moved its Equipment Division offices to the Division's manufacturing plant at 160 Charlemont St., Newton Highlands 61, Mass.

Swartwout Co., Cleveland, has located the sales headquarters for the firm's autronic control and power plant divisions at its Los M. A. Gibbons

Angeles district office. Gil Moore & Co., agents for Swartwout's industrial ventilating division will continue to maintain offices in the City.

Monarch Machine Tool Co. has moved its Detroit sales office to 10600 Puritan Avenue. The larger quarters at the new address will provide for the firm's expanding business.

New Companies

International Testing Service, a division of Jackson & Church Co., Saginaw, Mich.—To provide engineering services to firms on problems in testing, instrumentation and related fields of research and development.

G. S. Equipment Co., Cleveland— To serve the metal finishing industry with new equipment of its own design and manufacture. One unit of equipment currently being developed is a plating barrel of revolutionary design slated for introduction in the near future.

Vitro Corp. of America, New York

—As result of the merger of Vitro

Mfg. Co. and its two subsidiaries, Vitro Corp. of America

and Vitro Chemical Co., the

firm will retain the same capital

structure and will include five divisions or operating units. The

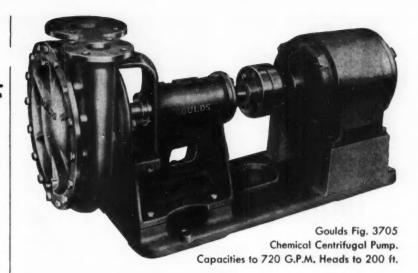
various units are engaged in the

manufacturing of chemical products and in design, engineering

and consulting operations.

Alexander Leggin—The establishment of offices for the general practice of business and industrial consulting in Washington, D. C. Mr. Leggin was the former assistant to the president of Wyandotte Chemicals Corp.

U. S. Fire Protection Engineering Service, Inc., Kansas City, Mo.— To offer a complete experienced



Now available in these 8 different materials!

You know the Goulds Fig. 3705 as the pump that is saving chemical plants thousands of dollars in handling corrosive liquids such as acids and alkaline liquors.

You've asked if it could be supplied in materials other than stainless steel 316 and FA-20. Here's the answer:

You can now take your choice of these eight different materials:

- 1. Stainless steel 316
- 2. Stainless steel FA-20
- 3. Stainless steel 304
- 4. All iron
- 5. All bronze
- 6. Bronze fitted
- 7. All iron, stainless steel trim
- 8. All bronze, stainless steel trim

And you can take advantage of these four saving benefits:

- a. Long packing life and freedom from leakage—Stuffing box on suction side of impeller means pressure is limited to suction head.
- b. Easy cleaning and inspection Suction and discharge connections in casing permit removal of casing cover and impeller without disturbing piping.
- c. Impeller clearance adjustable for wear—By loosening and sliding end cap along shaft you expose locking collar on outboard ball bearing, permitting you to readily adjust impeller position.
- d. Low parts inventory Interchangeable parts permit you to keep inventories down and prevent excessive down-time.

To get full information on these new materials, plus performance curves, specifications and dimensions, contact your nearby Goulds representative, or clip and mail the coupon for new Bulletin 725.3.



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Dept. CE, Seneca Fall	ls, N. Y.
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AIR can be just as important to you!

The higher a jet flies — the thinner the atmosphere . . . the more important the pilot's air supply.

Perhaps your plant's air supply...
prime mover in dust and fume collection... is getting dangerously
"thin." Dust and fumes "out of
control" run up costs, may
affect employee morale and
plant-community relations.

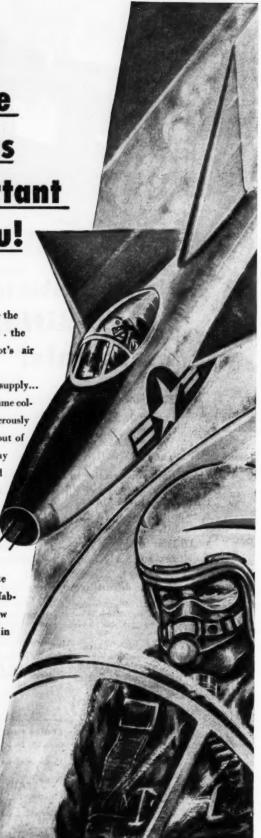
Kirk and Blum, with
46 years of experience
in the application of
"clean air . . . the invisible tool," assumes complete
responsibility for design, fabrication and erection of new
systems or more capacity in
existing systems.

Write The Kirk & Blum Mfg. Co., 3208 Forrer Street, Cincinnati 9, Ohio.

For Clean Air . . . The invisible Tool

KIRK-BLUM

DUST AND



FIRMS . . .

staff of fire prevention and fire protection engineers and consultants for service to industry.

Selas Constructors, Inc., Houston, Tex.—To facilitate fabrication, erection and service of the operations of the parent company—Selas Corp. of America—a producer of gradiation heaters and fluid processing equipment. The recently acquired Clare Construction Co. will serve as the nucleus of the new firm.

Pyrofax Gas Corp., New York— Formerly the Pyrofax Gas Co., a division of Union Carbide & Carbon Corp., is now a unit of the Corporation. In Canada, operations will be conducted by Pyrofax Gas Ltd.—a subsidiary of the new Corporation.

Deerfield Plastics Co., Inc., South Deerfield, Mass.—To enter the field of custom extrusion and fabrication of thermoplastics. The firm is prepared to extrude a variety of materials such as acrylics, polystyrene, and polyvinyl chloride and will specialize in the production of high precision cellulose acetate and butyrate tubing.

New Lines

Spencer Chemical Co., Kansas City, Mo.—Expansion of the firm into the polyethylene field. The firm's Orange, Tex., plant will go into production in mid-1955. In preparation for the new line, Spencer has also realigned its technical service organization.

Croll-Reynolds Engineering Co., Co., Inc., New York—Acquisition of the design and manufacturing rights of the Titeflex industrial filter, for the chemical and processing markets, obtained from Titeflex, Inc. Newark, N. J.

Magnesium Co. of America—Adds aluminum materials - handling equipment to its regular line of magnesium products in a move to meet the increasing demand for materials-handling equipment



Est. 1859 for Pumping SULPHUR

This TABER steam jacketed, Vertical Pump was designed to handle molten sulphur. Note the massive construction. Supporting the suspended pump from channel steel permits the use of an open shaft. This is especially desirable for molten sulphur.

Steam jacketed discharge pipe keeps molten materials from solidifying.

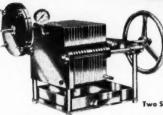
Pump operates efficiently at the relatively slow speed of 1750 r.p.m. (We consider 3600 r.p.m. prohibitive because molten sulphur has no lubricating properties.)

Write us the Head, and gpm you wish to handle together with the depth of your sulphur pit, and we shall send further information, with BULLETIN V-837.

TABER PUMP COMPANY 294 ELM STREET . BUFFALO 3, N. Y.

PYROGEN & BACTERIAL RETENTIVE FILTERS

MODEL



PROVIDES FOR DOUBLE FILTRATION EASY TO SET UP **EASY TO CLEAN** PRECISION MACHINED NO WASHERS COMPACT & PORTABLE

Two Sizes: 8 Inch and 4 Inch Square

able for either double or single filtration. Double filtration is rec-ommended for critical pyrogen ommended for critical pyrogen or small production use. Model 8 and bacterial retentive work. Available in highly polished stain-less steel; can also be furnished in Lucite construction. Lucite is only dates 4" square sheets.

This most versatile unit is avail- recommended for applications below 1200 F. Compact size makes ESS Models ideal for laboratory

Write for illustrated bulletin 8-4 EL

ERTEL ENGINEERING

KINGSTON 9. Branch Office & Showroom Located in New York City

COMPLETE LINE OF THOMAS Liquid Handling Equipment



SUPER HIGH PURITY

by the trouble-free magic of ion exchange





Penfield Mono-Column Demineralizer Model M-100, Purity of effluent: less than 2 ppm. Flow rate: 60-90 gph. Dimensions: 11/2' x 2' x 7'. Features inspection window that allows easy inspection of crucial middle distribution system.

Penfield Mono-Col-Penfield Mono-Col-umn Demineralizer Model MA-1000. Pu-rity of effluent: un-der 1 ppm. Flow rate: 1000-1200 gph. Dimensions: 2' x 5' x 5½'. Features automatic shut-off and signaling de-vices and fully auto-matic regeneration matic regeneration system.





Penfield Dual-Column Demineralizer Model UL-60. Purity of effluent: 5 to 10 ppm. Flow rate: 75-100 gph. Dimensions: 2' x 2' x 4½'. Features self-contained stainless steel control cabinet in which regenerant tanks are stored.

READY TO OPERATE ON ARRIVAL!

Available in a wide variety of mono-and multi-column models (flow rates from 10 to 10,000 gph), all Penfield Demineralizers come equipped with regenerant tanks and all necessary gauges, flow meter, conductivity meter, etc. On arrival at site, simply connect the completely "packaged" unit to service lines and start receiving super high purity Penfield demineralized water.



Any model Penfield Deminer-alizer may be secured with automatic shut-off and signal-ing devices and a fully auto-matic regeneration system. Special control systems for the automatic maintenance of the purity of storage tank water supplies also available.

Write for fully descriptive catalog. PENFIELD M'FG. CO., INC.

19 High School Ave., Meriden, Conn. Filters - Softeners - Degasifiers - Demineralizers

PENFIELD "PLANNED PURITY" PAYS!

Now you can have the advantages of USCOLITE* in your valves as well as in your piping



Developed to supplement Uscolite* pipe and fittings, the new Uscolite bodied Hills-McCanna Diaphragm valve, now makes it possible to utilize Uscolite's advantages throughout your piping layout. The unique Saunders patent design of the valve coupled with the chemical resistance of Uscolite makes the valve ideal for plating, water treatment, and in the manufacture of fertilizer, bleach, storage batteries, pulp and paper, etc.

paper, etc.

The Hills-McCanna Uscolite bodied valve is available in standard sizes from ½" through 2". It is suitable for pressures to 150 psi and for temperatures to 170° F. (at some sacrifice of pressure rating in larger sizes)

Write for details. HILLS-McCANNA CO. 2341 W. Nelson St., Chicago 18, Ill.

DESIGN

- Working parts isolated from flow.
- No packing.
- Leaktight under pressure or vacuum.
- Simple pinch clamp closure principle.
- Minimum maintenance even in the severest service.

HILLS-MEGANNA

saunders patent diaphragm valves

Also manufacturers of

Chemical Proportioning Pumps • Force-Feed Lubricators

Magnesium Alloy Sand Castings

FIRMS . . .

made of light metals. The new line was added as a result of the purchase of the Tobey Mfg. Co., El Segundo, Calif.

N. Y. Air Brake Co.—Vacuum pumps, used in the chemical and machine industries, and pumps for handling viscous liquids have been added to the firm's lines as a result of the acquisition of The Kinney Mfg. Co., Boston, Mass. The Kinney firm, now a division of N. Y. Air Brake, is the fifth hydraulic equipment manufacturing unit acquired since 1941.

Carborundum Co., Niagara Falls, N. Y.—Tubular ceramic electrical insulators, precision formed ceramic insulators, capacitors and resistors have been added to the firm's lines as a result of the acquisition of the Stupakoff Ceramic & Mfg. Co., Latrobe, Pa.

New Representatives

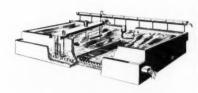
International Process Equipment Corp., Dallas, producers of small carbon dioxide manufacturing plants and affiliated products, has chosen the Liquid Carbonic Corp., Chicago, as exclusive sales agents on a world-wide basis.

Bamfords Ltd., Uttoxeter, England, has chosen the International Selling Corp., New York, as exclusive distributor of Bamfords' slow-speed diesel engines in the U. S. and Canada.

A. O. Smith Corp., Welding Products Div., has appointed the Southern Oxygen Co., Bladensburg, Md., as distributor in the Middle Atlantic States for the firm's various welding products.

Ampco Metal, Inc., Milwaukee, has named the Allan P. James Co., San Francisco, as a distributor of Ampco grade 18 centrifugally cast bars and Ampco grade 15 extruded rod.

Orr & Sembower, Inc., Reading, Pa., has appointed the Charles M. Setzer & Co., Charlotte, No.



Investigate the
AUTOMATIC BACKWASH
RAPID SAND FILTER



Here is a sand filter which cleans itself
— automatically — with no interruption
whatever to the filtering operation. No
shutdown or changeover is necessary
while cleaning is in progress.

The secret lies in its special, compartmented filter bed and traveling backwash mechanism which automatically cleans one compartment at a time.

May be used for plant supply water or for waste water treating. Write for Bulletin 46-A-11.



New York - Torque - Change - Hibbang - Routine - Ball Lake City - San Francisco

new Type Eppenbach COLLOID MILL

Featuring

Large Tangential Outlet which prevents back pressure and allows increased output capacity Both Rotor & Stator are Interchangeable Stellite rings and stones—facilitating replacement when required.

Sanitary fittings throughout.
Illustration shows large production Mill Model
QV-11 with 15 H.P. motor

Eppenbach Colloid Mills operate at speeds approaching the theoretical minimum required for true wet micro grinding—shaft speeds up to 10,000 r.p.m. depending on size and type of mill.

These Mills assure uniform grind through advanced engineering features including (1) Improved ball bearings which center the shaft and minimize lateral whip and (2) Invar shafting with zero coefficient of heat expansion.

All Mills can be made with pressure feeds and jacketed hoppers.

Consult our Sales Department with your technical problems.

Write for literature describing Eppenbach equipment —now manufactured and sold by:



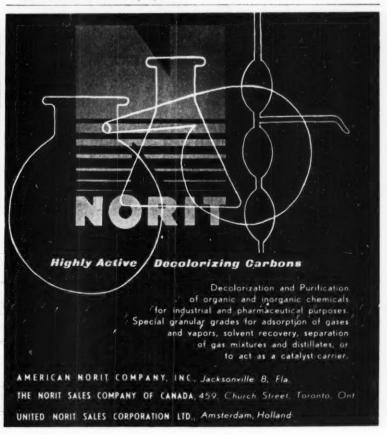
Direct-drive model shown operates of 3500 RPM. Higher speeds can be furnished. Colloid Mills mode in all sizes from ½ H.P. model.

ADMIRAL TOOL & DIE CO., INC.

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All Teffon Yarn LATTICE BRAID* PACKING

For Service Against the Most Destructive and Corrosive Acids on Pump Shafts and Valve Stems

This new Teflon packing is *not* just another braided packing made from Teflon ribbon. It is a *totally* different packing made from an all-new Teflon yarn. The yarn is woven tightly by the patented Lattice Braid method into a relatively dense, firm braid with no large voids. Garlock can furnish Teflon yarn packings in two styles—

No. 5883 LATTICE BRAID packing—composed 100% of Teflon yarn. No. 5888 LATTICE BRAID packing—composed of 100% Teflon yarn and treated with Teflon suspensoid:

They are furnished in coil and ring form in sizes $\frac{1}{8}$ " to $\frac{1}{2}$ ". Both packings are superior to any other types of braided Teflon packings for service against the *most* destructive or corrosive acids at high pressures and temperatures up to 500° F. For example, note this service report—

Duplex pump, 15% shaft, 3% packing size, pumping sulfuric acid at 12,000 p.s.i. New Teflon yarn packing was installed. Customer reports that after 1400 hours they added 2 rings and are still operating. (Best prior service was 330 hours with a blue asbestos braided packing with Teflon suspensoid.)

Contact a Garlock representative at the sales office nearest you. Get his recommendations on the new Teflon yarn packings and on other Garlock Teflon products.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Branch Offices: Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland Deaver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N.Y.) • Philadelphia Pittsburgh • Portland (Ore.) • Salt Lake City • San Francisco • St. Louis • Seattle Spokane • Tulsa

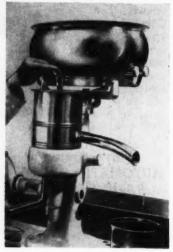
in Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.
*Registered Trademark. †du Pont's Trademark for its tetrafluoroethylene resin,

GARLOCK

PACKINGS, GASKETS, OIL SEALS
MECHANICAL SEALS
RUBBER EXPANSION JOINTS

FIRMS . . .

Carolina, as sales and service representative handling its Power-master packaged automatic boilers in the Carolinas.



Merco Centrifugal Co. has named the Cherry-Burrell Corp., Chicago, as distributor for its Westfalia clarifier—a versatile laboratory centrifuge that can be used for clarification, mixing and emulsifying, and solvent extraction.

Hydrocarbon Chemicals, Inc., Newark, N. J., will be represented by Millmaster Chemical Corp, New York, as exclusive selling agent for its sulfonic acid, sulfonates and related products.

Nopco Chemical Co., Harrison, N. J., has selected the Dillons Chemical Co., Montreal, as Canadian distributor for its pharmaceutical products. Nopco products will be supplied by the firm's new manufacturing facilities in London, Ontario.

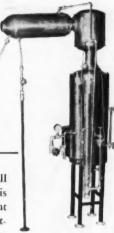
Food Machinery & Chemical Corp.

—Westvaco Chlor-Alkali Div.
and Westvaco Mineral Products
Div. will be represented by the
Westvaco Chemical Div., New
York, as sales agent for all chemical products.

Northern Pigment Co. Ltd., New Toronto, Canada, has appointed the Smith Chemical & Color

NO IMPURITIES **POSSIBLE** WHEN YOU USE THE

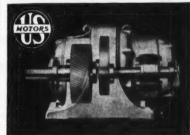
The outstanding feature of every NP Water Still (aside from dependably economical operation) is the fact that no impurities can enter. The resultant distillate is PURE, and suitable for the most exacting and critical needs. This is the result of careful engineering design, the use of the SINGLE COILED TUBE condenser, and the NP Impurity Discharger. The NP Water Still is the most advanced still on the market today.



Steam Heated Stills p to 250 gal. per hour Electrically heated type. up to 10 gal. per hour. Gas Heated. up to 50 gal, per hour. Complete details and specifications

Geared

SYNCROGEAR



The power-packed motor that internally gears its speed

DON'T go to the expense of installing a gear box with extra coupling and guards to rig up slow speed for a motor. Install the U.S. Syncrogear motor and avoid extra contraptions. You'll simplify your power hookup, save space, eliminate hazards and give your driven machine the most efficient power. The U.S. Syncrogear motor was one of the first complete integral power units, introduced 23

* The only geared motor with solid shank pinion 4 TO 10,000 R.P.M.

1/4 TO 30 HP.

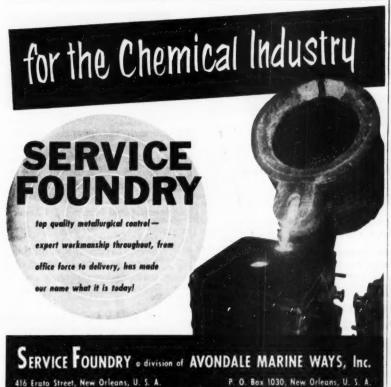
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Name			
Name			

CONSOLIDATED MACHINE CORP.

Manufacturers of

Stills, Sterilizers, Autoclaves, Hospital and Laboratory Equipment Water Demineralizers

39 SUDBURY ST., BOSTON 14, MASS.



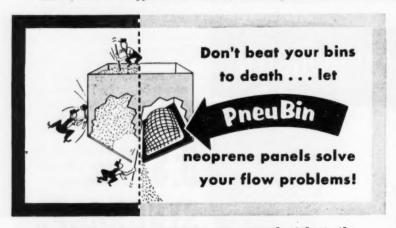
Cable Address: Serfdry



Material flow problems are our business. PneuBin is designed to aid in the evacuation of your bins through the principle of "positive displacement." We move the bin contents . . . not the bin.

The PneuBin unit consists of a steel-backed neoprene panel, mounted on the inside wall of your bin. By the pneumatic inflation and deflation of the panel, the bin contents are displaced and disturbed to activation. After the diaphragm has deflated, the air control unit (operating off the regular plant air supply) starts another cycle of inflation and deflation. The process continues automatically at whatever frequency is set on the air controller.

Because the neoprene panel is resistant to oils and most chemicals and is also thick and tough enough to withstand severe abrasive service, PneuBin is applicable to most any bin flow problem.



Sixes: PneuBin panels are available in 14 standard sixes, 4'' to 24'' wide, 6'' to 72'' long. Special sixes can be made if required in quantity.



FIRMS . .

Co., Brooklyn, N. Y., as representative for its synthetic ferrite pigments and related products in 13 Eastern states.

Cleveland Vibrator Co., Cleveland, has appointed the Industrial Vibrator & Machinery Co., San Francisco, as distributor on the West Coast for its complete line of vibrator equipment used in the handling of chemicals and aggregates.

Archer - Daniels - Midland Co., Cleveland, has named the newlyincorporated Westwood Chemical Co. as New York sales agent for ADM rubber makers stearic acid to the rubber industry.

Cowles Co., Inc., Cayuga, N. Y., has selected George E. Missbach & Co., Atlanta, and the Truesdale Co., Allston, Mass., as new distributors for its ultrafast dissolver.

New Facilities

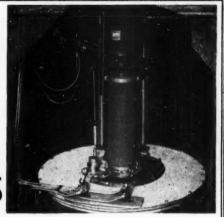


Detrex Corp., Detroit, Mich.—A branch warehouse and office located in suburban Los Angeles has been established by this manufacturer of industrial cleaning equipment and chemicals.

International Minerals & Chemical Corp., Chicago—A new Phosphate Chemicals Div. has been formed to comply with the firm's operations in the production of multiple superphosphate and byproduct uranium compounds.

U. S. Rubber Co.—A new research center devoted to development in the fields of rubber, chemicals and plastics will be built by the firm in Wayne Township, N. J. In addition, the firm has begun the construction of new facilities in Baton Rouge, La., for the pro-

Fletcher PNEUMATIC UNLOADER FOR CENTRIFUGALS



The latest Fletcher development in its line of modern high-speed centrifugals is the use of pneumatic controls to greatly ease and simplify unloading operation. By this means the back-breaking and fatiguing hand cranking operation is eliminated, and the operator's efficiency is materially increased. The scraper is at all times under complete control.

The air-operated unloader also simplifies the design of a fume hood for noxious gases.

Write today for further information.

FLETCHER WORKS

235 GLENWOOD AVE. PHILADELPHIA 40, PA, ESTABLISHED . 1850

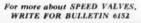
Autoclave NO-LEAK Speed Value HELD AT 6000 PSI FOR 30 DAYS



JAN. 10, 1953

Mo PRESSURE DROP REGISTERED

This valve was photographed twice . . . 30 days apart. As you can see, pressure was constant over the test period. Dependable performance is typical of AUTOCLAVE ENGINEERS' products. Another important AE feature is service. The valve and all fittings used for the test are instock items. A point to remember when you think of high pressure equipment.





FEB. 10, 1953

AUTOCLAVE ENGINEERS, INC.

ERIE, PENNSYLVANIA

EXPORT DEPT. . 751 DREXEL BLDG. . PHILADELPHIA 6, PA.

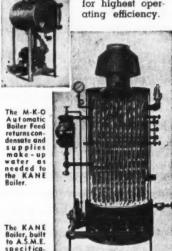




THE KANE BOILER PACKAGE

Here's a truly "unitized" steam supply—a compact, self-contained BOILER PACKAGE that is completely automatic... requires no attendant and only a bare minimum of floor space. The KANE BOILER PACKAGE includes: the correctly sized Automatic Gas-Fired Boiler complete with gas burner and controls to maintain required steam pressure; and an M-K-O Automatic Boiler Feed system designed to return condensate and

supply make-up water as required for highest operating efficiency



Engineered Steam at its best with over 50 years of experience at your disposal—so, send your steam problem to us for study and recommendation.

MEARS KANE OFFLOTING.

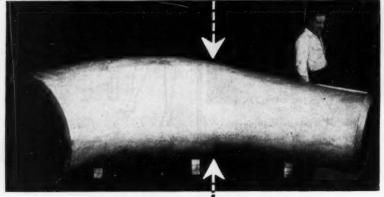
DIVISION OF S.T. JOHNSON CO.

CHURCH ROAD

BRIDGEPORT, PA.



This Casting



Casting weight 21,000 pounds

Shipping weight 14,000 pounds

Alloying Elements 38% Ni., 18% Cr., 2% Mo. Set

Record!

t's the weight rather than the Ni-Cr content that's the record.

We've cast many a piece with such a high Ni-Cr combination. But this represents the largest casting we have ever made. And it took careful scheduling of our entire battery of electric furnaces, with a double melt from two smaller furnaces.

Next followed a thorough X-ray for hidden flaws with our 400,000 volt unit. Then rough-finishing to specifications.

The significant fact is that this casting, the first of this size we have ever produced and destined for a most important high priority processing job, passed inspection with flying colors. There was no reject here. It is indicative of the skill of our metallurgists and foundrymen in turning out high alloy castings.

If you are looking for this kind of service, make Duraloy your casting source.

THE DURAL OY COMPANY
Office and Plant Scottdagle, Pa. Eastern Office: 12 East 41st Street, New York 17, N.Y.

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Arthurt. 12H Tull. October 12 St. Michigan Avenue

METAL GOODS CORP. Polling. Donor. H. Sans. Karsen City. New Orleans: St. Lains. Tulsor

FIRMS . . .

tions in the field of radio-activity in a new \$300,000 laborators in Schenectady.



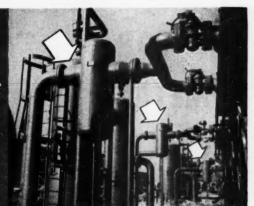
Industrial Filter & Pump Mtg.
Co., Chicago—A plant addition of 15,000 sq. ft. and new equipment marks the firm's third expansion program, in six years, in the field of pressure filter and ion exchange equipment production for the processing industries. As a supplement to these new facilities, the firm has formed a new research and development department.

Perkin-Elmer Corp.—Sales and service offices in Chicago have been opened by the firm in recognition of the growing importance of the Midwest as a center of chemical manufacturing and research. The firm manufactures a variety of instruments used to identify complex organic compounds.

Petrocarbon Chemicals, Inc.—A 1000 barrel-per-day Houdriformer will be constructed at the firm's Irving plant, near Dallas, by Tears Engineers. The reformer is designed for a considerable degree of flexibility for its use in petrochemical service.

Pennzoil Co.—Crude distillation unit—at Pennzoil's Rouseville, Pa., refinery—will be installed by the M. W. Kellog Co., subsidiary of Pullman Inc. The unit will replace three smaller existing structures.

Nopco Chemical Co., Harrison, N. J.-Acquisition of a controlling interest in Yocum Faust, Ltd., London, Ont., will give Nopco facilities for production FOR THE
ANSWER TO
SEPARATION
PROBLEMS
IN
CHEMICAL
PLANTS



SEE PERBUSS



Shown above are five Pe separators on outlet lines from cooling tower efficiently extracting entrained liquid. Performance Guaranteed. Call Peerless to solve your entrainment problem.



PEERLESS MANUFACTURING CO.

P. O. BOX 7193 * DALLAS, TEXAS * DIxon - 843

REPRESENTATIVES IN ALL PRINCIPAL CITIES





ALNOR VELOMETER

Alnor Velometer, a precision-built, self-contained, portable instrument, gives you instant, accurate readings of air velocities anywhere—in plants, mines, mills or laboratories. Measures speed of air flow through ducts, grilles, furnaces, spray booths or in the open. This rugged instrument needs no special care or delicate handling—anyone can use it and get accurate readings. Need no calculations or reference charts. Available in a wide variety of scale ranges, and with a full assortment of jets and fittings for every application. You'll want full details and prices, so write for Bulletin 2448-G, Illinois Testing Laboratories, Inc., Room 559, 420 No. La Salle St., Chicago 10, III.



PRECISION INSTRUMENTS FOR EVERY INDUSTRY



FOR METAL PRODUCTS CONTACT

CONTACT

BOARDMAN

first!

WROUGHT IRON

You can save valuable time and money by taking your metal fabricating problems to an experienced team right off the bat...and that's BOARDMAN! More than 43 years of designing, engineering and manufacturing every type of metal product—from carbon steel, stainless steel, clad steels, aluminum and wrough iron—make BOARDMAN qualified to handle your fabricating jobs from drawing board to flat car.

THE BOARDMAN CHALLENGE

Whatever your metalcrafting needs may be, let our Chief Engineer fly to your plant for on-the-spot consultation, at our expense. For literature, quotations or immediate action, write, wire or telephone TODAY!



MILD STEEL



THE **BOARDMAN** CO

PO BOX 1152 + PHONE LD. 754

- PRESSURE VESSELS INCLUDING A.S.M.E.
 CODE VESSELS BATCHERS BINS BURNERS
 COLLECTORS CONVEYORS DRYERS
 - . DUCTS . ELEVATORS . FANS . FEEDERS

• FIRE TRUCKS • FLUES • HOPPERS • MIXERS • ROASTERS • SPOUTING • SMOKESTACKS • STERILIZERS • TANKS • TRANSPORTS • WASHERS



FIRMS . . .

and distribution in Canada of its line of industrial processing chemicals.

Atlas Powder Co., Wilmington—A \$2,700,000 structure, scheduled for completion early in 1955, will house Atlas' administrative headquarters. The new facility will allow for a future fifty percent increase in administrative staff.



Hyland Laboratories, Los Angeles—A remodeled plant will enable the firm to consolidate production, warehousing, management and other operations under one roof. The \$500,000 modernization program—highlighted by new processing equipment—paves the way for the addition of gamma globulin and various other specialties to Hyland's extensive lines.

Dobeckmun Co., Cleveland–Increased facilities and markets to serve industry's growing demand for laminated, coated and related products, have been obtained through the acquisition of Floyd A. Holes Co., Bedford, Ohio. The \$275,000 transaction involves an exchange of stock.

Delta Cotton Oil & Fertilizer Co., Jackson, Miss.—A 100-ton-perday cottonseed processing plant will be installed by the Blaw-Knox Co. Special features of the unit's design will provide for ready conversion to the processing of soybeans and other oil seeds.

MacMillan & Bloedel, Ltd., Vancouver, B. C.—A new facility will consolidate the firm's research activities in pulp problems and plywood processing.



MODERN EQUIPMENT and closest attention to every casting detail enable new Aloyco foundry to turn out the finest corrosion-resistant valve castings made.

New Aloyco foundry helps process industries in record expansion



PATTERN SHOP. In this well-equipped shop seasoned craftsmen make extremely accurate wood or metal patterns for valves of

During 1954, almost half the nation's total investment in new plants and equipment will go into the chemical and petroleum industries.

To meet their unprecedented needs for processing equipment, our new specially-equipped foundry will substantially increase the production of Aloyco corrosion-resistant valves.

For 25 years, Aloyco, the world's largest specialist in high alloy valves, has been helping the chemical process industries master valve corrosion problems. Alloy Steel Products Co., Inc., 1301 West Elizabeth Avenue, Linden, New Jersey.



Plants: Linden, N. J., Blaomfield, N. J., Elizabeth, N. J. DISTRICT OFFICES

ATLANTA, GEORGIA
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142 21 Jinos M
152 So McNgun Avs
142 21 Jinos M
152 So McNgun Avs
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154 21 Jinos M
155 CALP
155 CA



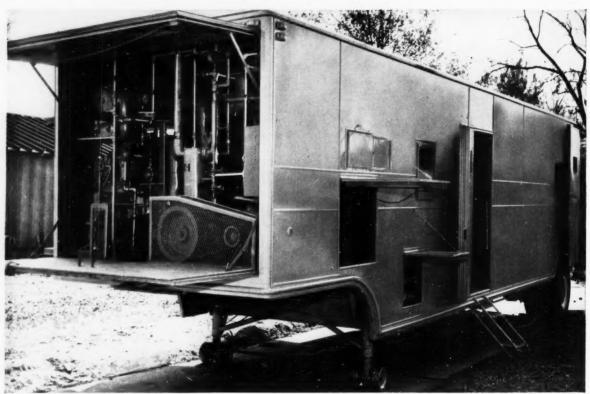
SHELL MOLDING. Up-to-date shell molding facilities assure users of the greatest contour accuracy in castings for small and mediumsized Aloyco valves.



INSPECTION AND HEAT STAMPING. Castings are carefully inspected, their "pedigrees" stamped in Any not 100% perfect are remelted, never welded or patched.



HEAT TREATING. After cleaning, all Aloyco austenitic type castings are heat treated and water quenched to insure maximum cor-



CARBON DIOXIDE SUPPLY from this mobile plant finds wide use in fire fighting apparatus of the Armed Forces as well as in numerous industrial applications.

Worthington condensing unit in portable CO2 plant

Mobile carbon dioxide generator designed for use of Armed Forces



YEAR IN, YEAR OUT—this new Worthington 4JF4 condensing unit delivers peak performance. Its versatility makes it the ideal choice.

At isolated airfields, depots and other military installations, a dependable supply of carbon dioxide for fire fighting apparatus is a must. This new portable carbon dioxide plant produced by the Girdler Co. of Louisville, Kentucky, was designed to meet those needs, and has been accepted by the Armed Forces.

The plant operates through the absorption of carbon dioxide from flue gas by Monoethanolamine — which in turn is regenerated. The carbon dioxide driven off is then cooled, compressed and condensed. And for this vital condensing cycle, a Worthington condensing unit with a 20 hp Freon-12 compressor was specified. The versatility of this rugged and compact unit made it an ideal choice for the job.

For over half a century, Worthington air conditioning and refrigeration equipment has been meeting large and small assignments for the armed forces, business, and industry. Every Worthington unit is not only Worthington-assembled, but more important, Worthington-made. You benefit by Worthington's complete unit responsibility:— a good reason to think of Worthington when you think of air conditioning. Get in touch with your nearest Worthington district office, or write Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.4.35, Harrison, New Jersey.

WORTHINGTON



CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME





Higher Ratings — to meet the demand for POWER-STATS with 20 ampere capacity.

Smell Size — "pancake" coil design provides compact assembly for panel or bench mounting.

Easy, Versatile Installation — 3 sets of mounting holes to suit all needs — simple to change from bench to panel mounting — binding post type terminals provide for any method of connection.

Smoother Operation — self-lubricating nylon bearing shaft support. Hand-fitted knob.

Easy Service — simply remove plate block for easy access to brush assembly.

Rhodium Plate Commutator—assures smoother performance and longer life—contact surface forever free of oxides—uniform contact drop maintained—corrosion reduced—allows greater overload characteristics.

Single and three phase assemblies are offered for manually-operated and motor-driven duty in 120, 240, 480 volt rating. Write for Bulletin P354.

SEE the complete line at the 1954 Radio Engineering Show, March 22 to 25 at Kingsbridge Armory in New York. Visit our exhibit in Booths 100-104.

THE SUPERIOR ELECTRIC

1403 CLARKE AVENUE, BRISTOL, CONN.

Manufacturers of: Forestell Verioble Transformers & Stabiline Automotic Vallage Regulators & Vollhor A.C. Forest Supplies & Forestell Light Dinning Supplies



TANKS and vessels that are CORRECT in design

 Whatever your needs in pressure vessels — gas storage tanks, pressure spheres, creosoting cylinders, bubble towers, gas scrubbers, etc.—you can depend on Cole for tanks that are correct in design and permanently leak-proof at the welded or riveted joints.

We also design and fabricate elevated tanks, acid tanks, dye vats, digestors, standpipes, storage tanks, etc. Write for latest Cole catalog—"Tank Talk."

Established 1854



OYCLOTHERM carries entire steam load of conventional boiler in 1/4th the space



Walter Johnson, Momence (III.) Greenhouses, says this about his 50 hp Cyclo-

"SAVINGS IN FUEL AND MAINTENANCE WILL PAY FOR THIS BOILER IN A FEW MONTHS"

For saving space, fuel, maintenance and money, nothing equals Cyclotherm Steam or Hot Water Generators. Completely literature: Dept. 30 packaged units ready to operate on arrival. Burn oil, gas or in combination. Save space of conventional units. Simple flue — no brickwork. Fully automatic controls. Underwriter approved. Exclusive, patented Cyclotherm cyclonic combustion principle — from cold start to full power in 15 minutes. Sizes 18 to 500 hp, 15 to 200 psi operating pressures.

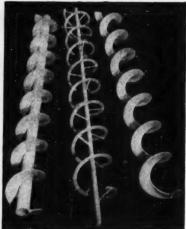
Write for free

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WORMS and SPIRALS

Made from Mild or Stainless Steel. Brass, Aluminum, Monel, Inconel



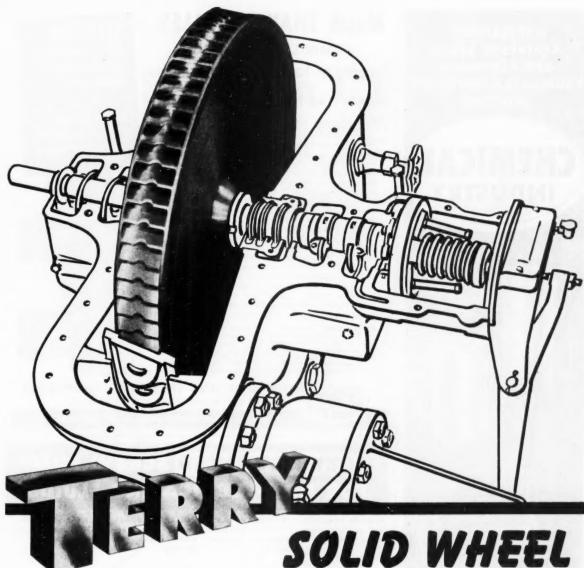
Prices on application

JAMES EAGEN & SONS 250 W. 8th St. Wyoming, Pa.

NEW BANISTER DUST COLLECTOR efficiently removes nuisance, toxic or hazardous dust



The Banister Dustmaster is a cyclone of modern design, incorporating big improvements in efficiency and working economy. It has application for removing nuisance, toxic and hazardous dust . . . thereby reducing equipment maintenance, increasing productivity, improving product quality, and maintaining a clean, healthful working atmosphere. Dustmasters also can be used for recovering valuable materials from dust, or as precleaners for filters and electric precipitators. Write A. W. Banister Co., Inc., 21 Charles St., Cambridge, Mass. for illustrated, 12page Dustmaster catalog.



SOLID WHEEL RUGGEDNESS

is your turbine dividend

The rugged construction and fool-proof design of a Terry solid-wheel turbine can save you money by keeping maintenance costs to a minimum. Usually only taken down for routine inspection, any repairs that must be made are of relatively simple nature, and cost of replacement parts is small.

The rotor of the turbine is a single forging of special composition steel, in which a series of semicircular buckets is milled. There are no separate parts to loosen or work out. As the only function of the blades is to form a series of pockets, any wear which might occur would not materially affect

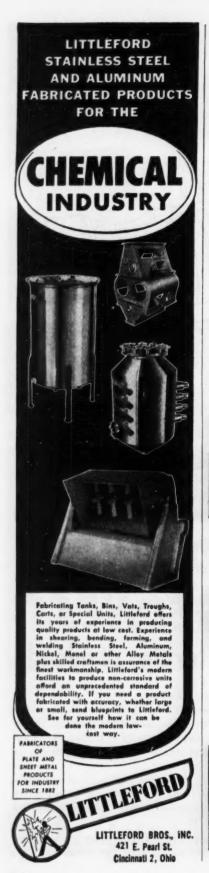
horsepower or efficiency.

It is impossible for the blades to foul. They have large clearances and are further protected by the projecting rims of the sides of the wheel. As the side clearances are also very large, end play can do no harm.

The Terry solid-wheel turbine is an extremely reliable piece of equipment—why not write for complete details today? Ask for a copy of Bulletin S-116.

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD 1, CONN.

TT-1198



Match THAYER SCALES

against your toughest bagging or batchweighing problems Speed · up to 12 bags per minute! Accuracy · to within 1/10 pound!

Whether batchweighing for formulations or bagging for shipment, you can speed filling and weighing operations — and get greater accuracy too — with a Thayer Fully-Automatic Net-Weighing Scale. Dry chemicals, plastics, etc. in powder, ing Scale. Dry chemicals, plastics, etc. in powder, granulated or pellet form are readily handled by a unique feeding system that closely controls amount and rate of flow. Any free-flowing or flooding material may be handled with accuracy and speed. The entire weighing and discharging operation is completely automatic.

Thayer Net-Weighing Scales handle charges from 1 to 500 pounds. Exclusive shockproof leverage system — without wear-vulnerable knife-edge

- guarantees continued accuracy. Hopper and feeding system are stainless steel for maximum protection against corrosion and contamination.

Thayer Gross-Weighing Scales are also available

for filling directly into bags, drums and cartons.

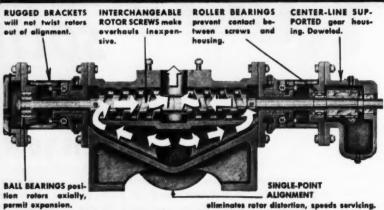
Checkweighing Problems? . . . write for information on Thayer Checkweight Scales which outomatically indicate weight of filled container and then separate off-weight units from properly filled packages! Types available for packages weighing from I to 200 pounds at rates up to 60 packages per minute. Latest Model 1005 automatically checkweighs bags and cartons before they are closed!

THAYER FULLY AUTOMATIC net-weighing filling scale MODEL 600N Write for detailed description today!

THAYER SCALE AND ENGINEERING CORPORATION 492 EAST WATER STREET, ROCKLAND, MASS.

Where weight is worth money . . . it pays to be sure!

MOST ADVANCED SCREW PUMP FOR NON-LUBRICATING FLUIDS



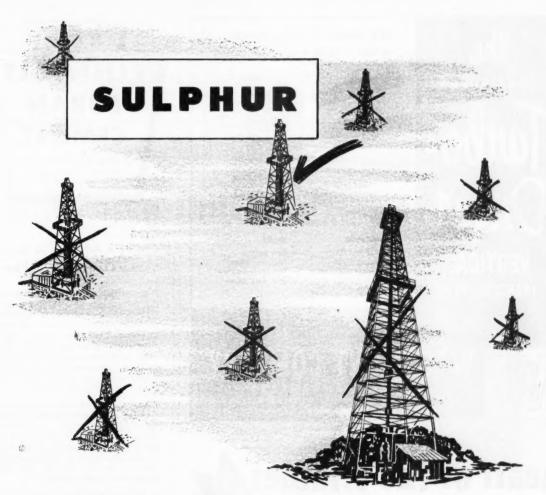
Sier-Bath External Gear and Bearing BRACKET TYPE SCREW PUMPS 32 SSU to 1,000,000 SSU; 1-700 GPM; 1000 PSI for viscous liquids, 500 PSI for water. Direct-connected up to 1800 RPM. Materials and construction adapted to meet any requirements. Sier-Bath Gear & Pump Co., Inc., 9259 Hudson Blvd., North Bergen, N. J.



Call Your Sier-Bath Pump Representative ... Send for Bulletin SE-5

Member A. G. M. A.

ures . . . also cufrs. of Procision Guars & Fluxible Guar Couplines Stor-Bath "Coares" and "Hydres" Pomps for lower capacities and pre-



... producing Dome Sulphur is a

Chancey business

What is the cost?," is a constant and persistent query in the minds of managers whether operating a manufacturing plant or a mine.

When erecting a manufacturing plant the manager selects his location in regard to transportation of raw materials to the plant and distribution of the finished goods. On the other hand, a mine is found where nature has placed the ore and production must be in that locality.

Texas Gulf Sulphur Co.

75 East 45th Street, New York 17, N. Y.

In the case of production of sulphur by the Frasch Process, the ore lies 500 to 2500 feet below the earth's surface where nature made the underground formation. No engineer can see producing conditions.

Because of variations in formations, some sulphur mines produce efficiently and cheaply. Cost of production and marketing compared with the price determines whether the sulphur is commercially available.

Sulphur Producing Units

- . NEWGULF, TEXAS
- . MOSS BLUFF, TEXAS
- . SPINDLETOP, TEXAS
- . WORLAND, WYOMING





PENNSALT FURAN CEMENT A Fura-Tone® Product mfg. under Pat. Nos. 2,461,510 & 2,600,764

Greatest Advance in Resin-Cement Chemistry in Ten Years!

Pennsalt Furan Cement combines all the advantages of ordinary furantype cements with many desirable new ones it alone can claim—yet costs no more. This new product supersedes other products as the most versatile general-purpose cement for bonding acid-proof brick or tile in construction of corrosion-resistant linings, floors, and trenches.

Based on a furfural-ketone resin, New Pennsalt Furan Cement is basically different from the furfurylalcohol types in common use. Like them, it is stable enough to be stored indefinitely, and does not cause dermatitis. But on all the following points it is clearly superior:

- An actual, workable 2-to-1 powder-solution ratio.
- 2. Increased acid resistance.
- 3. Increased alkali resistance.
- 4. Increased resistance to most solvents.
- 5. Longer working life.
- Easier handling characteristics less "temperamental" or "hot."
- Choice of powders—Powder C (carbon filler) and Powder S (siliceous filler).
- Economical to buy and use—costs no more than common furantype cements.

To give speedy service, Pennsalt has stocked this cement at many points throughout the nation. Pennsalt Corrosion Engineers are ready to offer technical aid on the product's use. For further information, write: Corrosion Engineering Dept., Pennsylvania Salt Manufacturing Company, 500 Widener Building, Philadelphia 7, Pa.

Fura-Yone is a trademark o Irvington Varnish & Insulate Division of Minnesota Mining & Manufacturing Company





News about COATINGS for METALS Metallic Protective Protective

Drum linings with strong chemical resistance offer

More Use Out Of Existing Drums

Preventive maintenance that really prevents corrosion

Application of Ucilon* Protective Coatings to plant structures and equipment is the secret of effective preventive maintenance in many plants. Systems of Ucilon Coatings do the job especially well because of their engineering approach to the problem of protection against strong corrosives.

First, the Systems don't overlook proper surface preparation and proper priming as required. This assures adhesion of top coats and resistance to undercutting. Second, Ucilon Coatings offer strong resistance to acids, alkalies, alcohols, oils, petroleum products, moisture, salt solutions and many other chemicals and corrosives. Coatings include vinyl, phenolic, chlorinated rubber and fish oil types.

As a result, Systems of Ucilon Coatings have been successful not only in preventing corrosion but also in lengthening intervals between paintings. Concise data given in Bulletin MC-6-write for it. *Trade Mark

Plastisol coating outlasts metal 4 to 1 in corrosive application

Here's a case showing the extraordinary protection you can give to metals in processing equipment.

Bleach reduction chambers of a noted chemical producer were coated with a Unichrome Plastisol Compound. This user reported that the coating gave 4 times longer service than even special alloy metals before requiring maintenance!

The exceptional chemical resistance displayed by these vinyl coatings is fortified by the thickness they develop—up to %6" by dipping or spraying. Tough and elastic, they bake to stable form at 350° F. Consult us on your need in such a coating.

Unichrome Drum Linings are helping substantially to cut packaging costs. They permit ordinary metal containers to be used for packaging and shipping a wide range of chemical or edible products without corrosion or contamination. In addition, by the degree of corrosion resistance they provide, Unichrome Drum Linings keep drum interiors in such good condition that it is often possible to reuse the drum.

IMPROVED PHENOLIC LININGS

Unichrome Series B-124 Linings, with their superior chemical resistance, are now recognized as outstanding improvements to the already dependable family of phenolic coatings. These baking materials are extremely tough and durable. They withstand strong acids, oils, food products, wetting agents, vinegar—even ketones, benzene and similar substances.

NEW EPOXY LININGS

Unichrome Series B-179 Linings provide essentially the same chemical resistance as the phenolics—plus greater flexibility and alkali resistance. These linings withstand severe abuse and impact without fracture.

SUBSTITUTING FOR STAINLESS

When lined with a Unichrome Series 4000 Lining, ordinary steel drums get such extraordinary protection that they can sometimes be used in applications generally requiring stainless drums. Vinyl base plastisols, these linings provide not only outstanding corrosion resistance, but also a substantial film thickness over the complete interior. They do not drain away from any area, and can be controlled to build up a thickness of from 3 mils to even $\frac{3}{16}$ inches if desired. This heavy duty coat-

ing has good flexibility and will withstand long hard use and shock without chipping away.

ALKALIES NO PROBLEM

Vinyl base coatings offer excellent, all around chemical inertness. Unichrome Series B-154 Linings, formulated from such materials, are suitable for use in contact with many products which are strongly corrosive to containers and which attack ordinary coatings. Caustics up to 50% concentration, for example, can be shipped in drums with this internal protection.

If you want to use a steel container for a new product—or if you seek better service from a lining and longer service from your present drum supply, contact the nearest office of United Chromium.

UNITED CHROMIUM, INCORPORATED

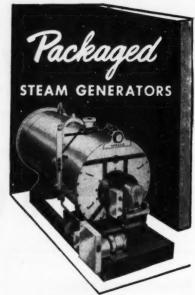
100 East 42nd Street, New York 17, N.Y. Detroit 20, Mich. * Waterbury 20, Conn. Chicago 4, III. * Los Angeles 13, Calif. In Canada:

United Chromium Limited, Toronto, Ont.









for HEAT or PROCESS

Economical, and highly efficient, SUPERIOR Steam Generators arrive at your plant ready to produce steam for process or heat. Completely factory assembled and tested, they are backed by undivided responsibility.

- Fully automatic burning oil or gas or both in combination.
- Mounted on rigid channel iron base, they require no special foundation.
- Built-in induced draft eliminates the need of an expensive chimney.
- Simple installation permits a nearby source of process steam.
- Battery installation provides extreme flexibility for varying steam demands.
- Special units for permanent outdoor installation.
- Fire-Tube models in 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i.
 Write for catalog 622-F.
- Water-Tube models in 9 sizes from 200 to 1,000 b.h.p. for pressures up to 400 p.s.i. Higher pressures on special order. Write for catalog 622-W.

for performance you can BANK on



SUPERIOR COMBUSTION INDUSTRIES INC. TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

Walworth's NEW small cast steel valves

SERIES 1500 - SIZES 4 to 2 inches

handle

HIGH HIGH

temperatures

pressures

Y-Globe Valves:
No. 5585-Socket Weld Ends

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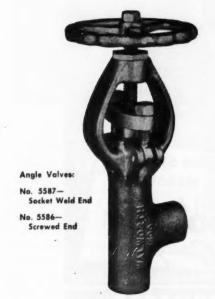
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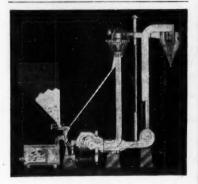
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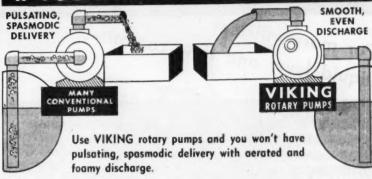
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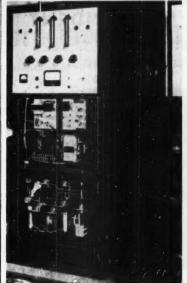
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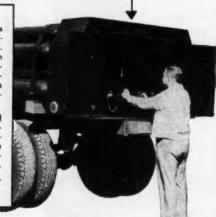
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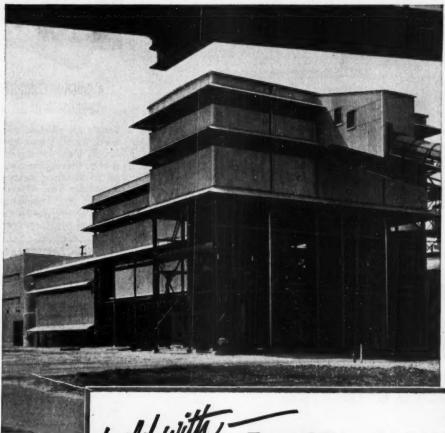
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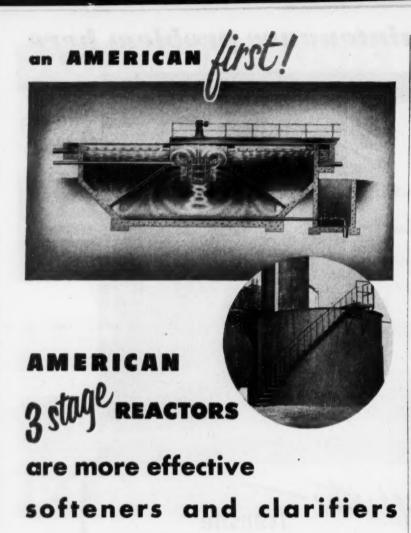
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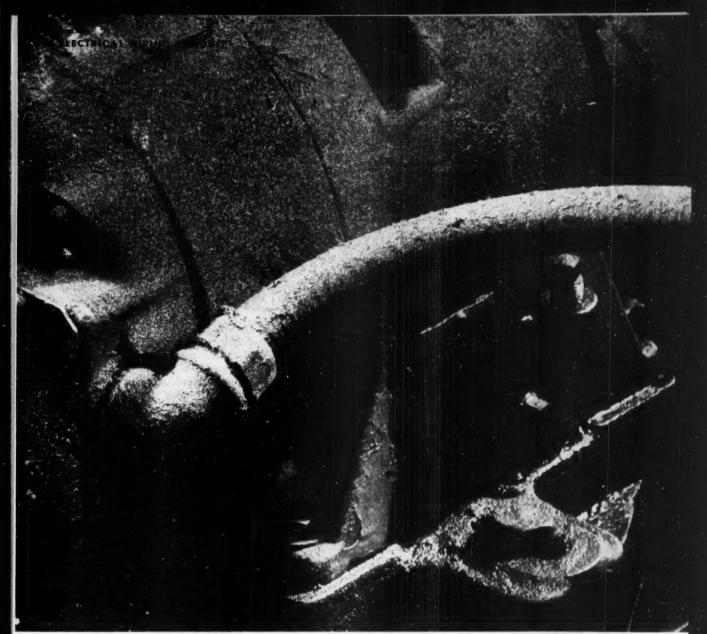
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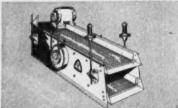
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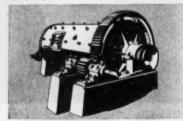
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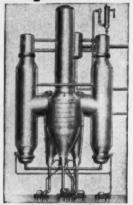
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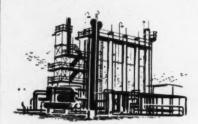
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March 1954—CHEMICAL ENGINEERING

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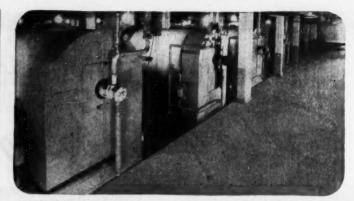
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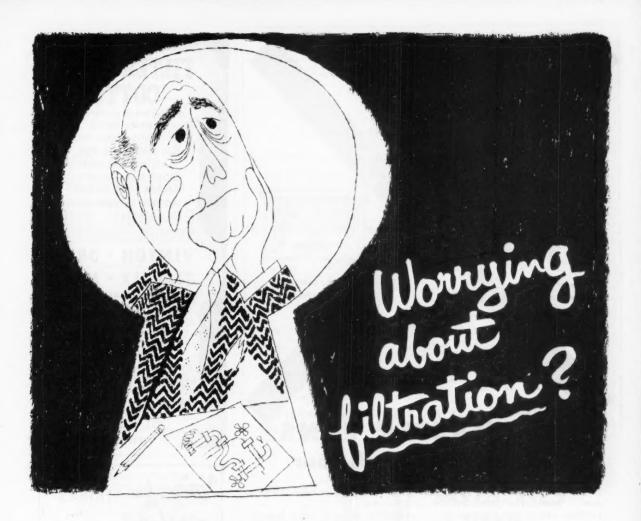
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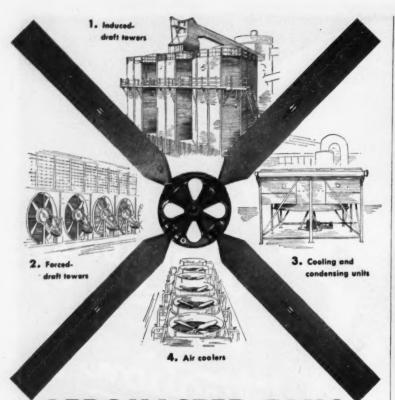


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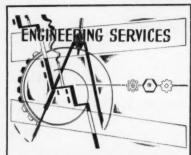
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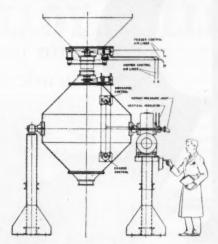
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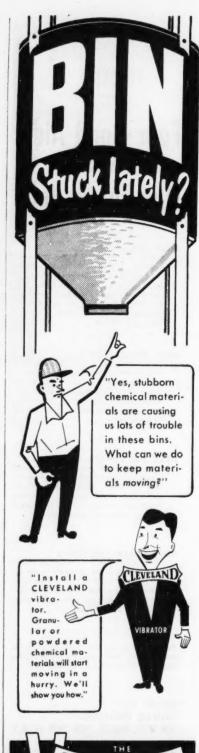
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Heat Exchangers with copper and copper-base alloy tubes are widely used for low temperature operation-Courtesy American Locomotive Company, Schenectady, New York.

Low Temperatures Improve Copper-Base Alloy Tubes...

Widely Used in Low-Temperature Processes

The impact strength of many materials becomes seriously impaired at low temperatures and may lead to failure if the equipment is subjected to a sudden shock or blow. Consequently, the selection of the proper metal for the construction of low-temperature service equipment, the heat exchanger tube alloys and the piping are essential.

Also important are the composition of the metal, the effect of heat treatment and the method of fabrication into the finished article. Alloys in solid solution are more stable than those whose structure is characteristic of precipitation hardening. Fortunately corrosion may often be a negligible factor in low-temperature operation.

Low Temperatures Widely Used

Low-temperature applications with Copper, Red Brass, and other copperbase heat exchanger tubes have spread to virtually all industries:

Fractionation of liquid air in the production of oxygen, nitrogen, argon, etc.

Production of low temperatures by liquid nitrogen, hydrogen freon and other refrigerants.

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Carbon Steels Become Brittle at Low Temperatures

The brittle behavior of a given metal can be evaluated by the notched-bar impact test. It cannot be recognized by standard tensile tests or even bending tests. Referring to the accompanying table, at low temperatures most carbon steels show a sudden loss in toughness, becoming brittle or vulnerable to failure from shock, although they gain appreciably in tensile and yield strengths in the low temperature range.

The Izod Impact value of low carbon steels dropped from 94 at room temperature to a low of 3 at -180°C, while per cent contraction of area dropped from 71.8% to 32.5%.

Stainless and low alloy steels with nickel content resist embrittlement at low temperatures and are suitable for structural purposes.

Copper and Its Alloys Improved at Low Temperature

Low temperatures have no embrittling effect on copper and copper-base alloys. In fact, their excellent mechanical properties are considerably improved at subnormal temperatures (as low as -300°F) as compared with room temperatures. For example, the tensile strength of copper rises from 31,400 to 50,800; its elongation from 48% to 57.6%; its Izod Impact values from 43 to 50. Note that the increase in the tensile strength is accompanied with increased toughness.

Brass and Cupro Nickel also show physical improvements at low temperatures. Welded joints made with silicon bronze also have increased toughness at low temperatures. Exceptions are the age-hardened copperberyllium alloys and the cast Cu-Zn-Pb-Sn alloys.

This explains the wide use of copper and its alloys for low-temperature applications in tubing, piping, valves and in the construction of vessels for handling liquid oxygen. It must not be forgotten that among the advantages of copper and its alloys are their fine heat-transfer properties.

Much technical information on condenser and heat exchanger tube alloys, their applications and physical properties is published in Bridgeport's 156page "Condenser and Heat Exchanger Tube Handbook." Write for your copy on company stationery. Contact your nearest Bridgeport sales office for your tube requirements and technical service from our Laboratory. (1542)

Properties of Annealed Metals at Room Temperature and at -180°C

METAL OR ALLOY	Tensile Strength		Yield Strength, 0.1% Extension psi		% Elengation in 2"		% Contraction of Area		Value (ftlbs.)	
	of room Tomp.	-180° C	af room Temp.	-180° C	of room Temp.	-180° C	of room Temp.	-180° C	at room Tomp.	- 180° (
Copper	31,400	50,800	8,500	11,500	48.	57.6	76.5	77.	43.	50.
70-30 Brass	51,100	73,500	28,200	29,600	49.4	74.6	77.	73.	65.5	78.5
80-20 Cupro Nickel	51,600	73,800	27,700	32,500	25.5	35.6	77.5	72.	77.	85.
7% Aluminum Br'ze	77,300	96,100	26,600	29,200	26.	28.5	29.	30.	24.	20.5
Pure Aluminum	9,800	20,800	4,400	4,550	35.9	43.8	90.4	87.	19.	27.
Low Carbon Steels	65,700	121,500	54,600	60,500	29.7	27.0	71.8	32.5	94.	3.0

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DRYERS & KILNS

Devine #12 Vac. Shelf Dryer 46" x 42" Shelves.

5' x 15' Rotary Kiln brick lined, compista.

8 & 3 3" x 15' Evendur Rotary Dryer.

2—Albright-Neil 4' x 9" Atmes. Grum Dryers.

1—Buffale Vac. Drum Dryer 24" x 28".

5—6 clam, Gas & Electric Dryers, Tray & Truck.

8—Rotary Dryers direct & Indirect, also Jacketed & Compision of the Compision of the

CENTRIFUGALS & CENTRIFUGES -Cleintri de Suspende Type Cartrilugals. Bot-tom Discharge. Meter Driven. -Centrifugals 12", 30", 40", 42" & 48" Steel, Copper, Stainiess & Rubher Lined. -Sharaise Centrifuges 255 Stainiess. Also 26. -De Lavai Multiple Clariflers \$200, 306 & 301.

FILTER

-Vallez 4i Stainless Covered Leaf Filter, type 49. -Sperry & Shriver 12", 15", 16", 24", 30", 36", iron & wood Filter Presses, also disc Type, letiand & Oliver Rotary Vas. Filters. KETTLES & TANKS

KETTLES & TANKS

100 gal. Stainless Steel elessed agit. Jack. Kettie.

11—Doys 356 gal. C.I. Jack. Vac. Kettie.

120 gal. Stainless Steel elessed agit. Jack. Kettie.

120 gal. Stainless Stainless

PULVERIZERS & MILLS

Patterson 30" x 42", 6' x 5', 6' x 8' Pebble Mills. Abbe 24' x 33" & 30" x 30". Also Jar Mills. 8! Raymond Automatic Pulverizor 20 H.P. meter. !—Raymond 800 Pulverizor 20 H.P. Complets.

4—2000 Raymond Mills.
Buchanan 12" x 12" Jaw Crusher.
I—Hammer Mills & Pulverizers 3 to 50 H.P.
I—Sturtevant 30" Reck Emery Mill.
I—Robinson 18" & 22" Attrition Mills.
I—Lehman 4 Roll W. C. 12 x 36" Steel Mill.
I—Robinson 18" & 22" Attrition Mills.
I—Sturtevant 30" Reck Emery Mill.
I—Lehman 4 Roll W. C. 12 x 36" Steel Mill.
I—Lehman 4 Roll W. C. 12 x 36" Steel Mill.
I—O" x 30" Double Steel Roller Mill.
I—O" x 30" Double Steel Roller Mill.
I—O" x 30" Steel Roller Mills.
I—Will Steel Roller Mills.
I—Will Steel Wildern Roller Cutters.
I Steel Wildern Roller Cutters.
I Mixers & Screen Steel Mills.
I Mixers & Screen Steel Mills.
I Mixers & Screen Steel Steel Mills.

MIXERS & SCREENS

MIXERS & SCREENS
Baker Perkins double arm 100, 50 & 9 gais.
5—American Teol 300 gai. Churns.
Horiz. Mixers single & double arm to 200 gal.
4—Day 8, 15 & 40 gal. Pony Mixers.
1—Century 2 HP. 4 speed Vert. Mixer.
5—Lead & Paste Mixers 50 to 150 gals.
1—Tyler 3' x 5' Vibratory 2 Deek Screen.
Patterson 42" dia. Stainless Conical Blender.
10—Dry Spires Mixers 50 to 2003".
10—Dry Spires Mixers 50 to 2003".
2—Portable Ric., Agitators 16, 40 2 H.P.

MISC. & SPECIAL

MISC. & SPECIAL

Stokes # 280, 4" dia. Preform Machine.
Stokes E Tablet Machine 1/8".

B 4 J 4 Abbe # 2000 & #! Rotary Cutters.
Anderson & French Oil Expellers.
Sty Dust Collector. Bag Type. 242 eq. ft., complete.
General Part Contribution Pumm. 250 P81.
Pneumatic Scale Automatic Capper M.D.
1-Marce 200 Stainless Bred Homogenizer.
1-Stokes & Smith & Day Powder Fillers.
Filling Machines & Labelers.
Retary & Single Punch Tablet Machines, 1/2" to 4".
1-Howe Mogul Barrel Bag Picker.
2-Worthington 12" x 12" x 12" v ac. Pumps.
0-Devine Stokes & Suffalo Vas. Pumps.
0-Devine Stokes & Suffalo Vas. Pumps.
1-Indica & Rubber Mills & Calenders.
Plastic & Rubber Mills & Calenders.
Pilastic & Rubber Mills & Calenders.
Folier & Serew Cenveyors, Portable Elevators.
Revelviris Pans. Bullers—Gas, Oil & Ceal.

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A RENTAL COMPRESSOR FOR EVERY JOI 55 CFM Lindsuy (GAS) Portable 60 CFM Worthington (GAS) Portable 70 CFM Smith (GAS) Portable 89 CFM 6x 7 Worthington HP, 15 HP Elec. 105 CFM Worth-IR-CPT Portable 107 CFM 7-7 x 7 Ingersoil E5-1 STEAM 129 CFM 7/2 x 7 American AF1, 20 HP 142 CFM Ingersoil Semi-Portable 25 HP 160 CFM IR-Worth-Portable 25 HP 160 CFM IR-Worth-Portable 25 HP 175 CFM 8-9 x 9 Worthington HS STEAM 210 CFM Worthington (GAS or DIESEL) Port 279 CFM 11-10 x 11 Worthington HS STEAM 279 CFM 10 x 12 Worthington HS STEAM 279 CFM 10 x 12 Worthington HB, 50 HP 315 CFM Worthington HS, 50 HP 445 CFM 12 -14½ x 13 American AF-S STEAM 500 CFM Worthington (GAS or DIESEL) Port 387 CFM Gardner Semi-Portable 100 HP 462 CFM 12-14½ x 13 American AF-S STEAM 500 CFM Worthington (DIESEL) Portable 388 CFM Worthington (DIESEL) Portable 200 CFM Worthington (DIES

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- Bubble Cap Column, High Chrome Iron, 64" dia. x 13 plates.
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- Sections 6' dia. St. St. Baffle Plate Column.
- 3-Aluminum Bubble Cap Columns, 36" dia. x 45 plate; 27" dia. x 18 plate.
- Aluminum Perforated Plate Column,
- 28" x dia. x 36 plate.
 1—Copper Column with 18—30" dia.
 perforated plates and 10—24" dia. bubble cap plates.

CONDENSERS-EXCHANGERS

- 3-St. St. Pipe Coolers-73, 78 & 400 sq. ft.
- -Alum. Coil Exch. 47 sq. ft. -Copper tub. 65, 140, 1350 sq. ft. S.S. Tubular Exchangers 14, 55, 70,
- 160 & 400 sq. ft. -Steel Shell & Tube, 1000 sq. ft.
- 3-S.S. Coil Condensers, 40 & 55 sq. ft.

FILTERS

- -International T304 St. St. #3 (24" dia.) and #5 (33" dia.)
- 1-Sweetland #10, 21 leaves, 31/2".
- 1-Sweetland #12, 72 leaves, 2".
- -Swenson Rotary Continuous Vacuum Filter: Precoat type, 8" dia. x 8' face, rubber covered and lead acid proof.
- FEINC Aluminum Rotary Vacuum string discharge, 4'6" dia. x 6'.
- Pressure Leaf Filters, 70 to 140 sq. ft.
- 1-Shriver 36" C. I. P&F., 20 ch. cl. dly.
- 1-Sperry 24" C. I. Filter Press, 16 Ch.
- Louisville 8-roll Continuous Filter or Grains Press, 24".

KETTLES-REACTORS

- 3—13 gal. Autoclaves, T347 St. St., 700# int. WP., 50# Pkt. WP.
- 1-St. St. T304 Pressure vessel. 18" dia. x 9'4" long, 600# W.P.
- 2-450 gal. Stainless Steel Kettles, Iktd. & Agit.
- 70-Stainless Steel and Stainless Clad open top, steam jacketed kettles-40. 80, 80, 100, 150, 500 gal. sizes.
- 4-Aluminum Reaction Kettles, Jktd. & Agit., 35, 60, 100 gal, and 250 gal.

MILLS-PULVERIZERS

- 1-Kennedy Van Saun 3' x 6' Air Swept Contin, Ball Tube Mill.
- -Williams Hammer Mill type AK; size A, stainless steel.

JUST PURCHASED

- -7500 gal. Vert. Stainless Steel Tanks, 7'6" dia. x 21' high.
- Stokes Jacketed Rotary
- Dryer, 3' dia. x 15' long. Buflovak 5' D x 12' L Vacuum Drum Dryer.
- Shriver Filter Press, 30", 24 chambers, open delivery.
- -Monel Tank, 3500 gal., 6' dia. x 16' H; 3/16" & 1/4"
- Stainless Steel Vertical tanks 6000 gal.; 10' D: 1/4" & 7/16" -Steel Reboiler, 5' D x 8'6" L
- Stainless Steel Packed Column, 14" D x 25' H
- -Ribbon Powd. Mixers, 40 cu ft. -Fitzpatrick Model D-6 Comminuter,
- St. St., 15 HP motor.
- Resina Auto. Screw Capper, for pt., qt. and qal, cans.

- 35-Aluminum Tanks closed, 4, 275, 330. 480, 500, 1350, 1450, 2300, 2700, 3000, 4100 and 9000 gal.
- 50-Horizontal Welded Steel Tanks from 3800 gal. to 21,700 gal. sixes.
- 1-Vertical Rubber Lined, 6000 gal. open.
- 8—15,000 gal. Vertical Welded Steel Closed Fermenting Tanks, 80 lbs. WP., turbine agitator with 40 HP motor; 970 lin. ft. 3" pipe coil. Excellent condition.

STAINLESS STEEL TANKS

- 3—T347 Pr. or Vac.—50 & 235 gal. 2—T316 Pr. or Vac.—35 & 160 gal. 1—T304 Pr. or Vac.—2½, 9, 150, 160
- & 260 gal. -T304 600# pr.—86 gal.
- Stainless Steel Storage Tanks from 15 gal. to 8200 gal. sizes.
- gal. Horizontal Stainless Steel Tank, 5'4" dia. x 18'9" long. insulated and agitated.

MISCELLANEOUS

- —St. St. Bin, T316, 275 cu. ft. cap. —AT & M Susp. 48" Centrifugal, Perf. Basket, Bottom discharge, T-304 s.s.
- Bird Susp. Centrifugal, 48" dia. Perforgted Basket, T347 St. St.
- DeLaval Centrifuges, models #600. 74-11 and 94-01.
 - B & J #11/2 Rotary Cutter. St. St.
- -Witteman Co. Atmospheric Double Drum Dryers. 22" x 38". -Kux Machine Co. Model 25 Rotary
- Pellet Presses, 21 and 25 punch. Selectro Vibrating Screens, stainless steel, 2' x 7', double deck, enclosed.
- Stokes Vertical Steel Jacketed Vacuum Chamber and Impregnating tank, 30" L x 25" W x 24" D.
- tank, 30° L x 25° W x 24° D.

 Vertical Agitators—40 HP gearmotor with Turbo #5B drive, 70 RPM.

 Baker-Perkins #14—JEM Universal
 Mixer, Jacketed, Vacuum Cover, 50
- gal. work, cap., 50 HP motor.
- 1—Porter heavy duty jacketed double worm mixer—75 gal. 140-St. St. Flanged Gate Valves, 1", 11/2", 2", 21/2" x 3".

HEADQUARTERS FOR STAINLESS STEEL EQUIPMENT

- 1—USED EQUIPMENT IN STOCK TANKS KETTLES RECEIVERS COLUMNS STILLS AG & MIXERS CONDENSERS HEAT EXCHANGERS COILS TUBING, PIPING, FITTINGS, ETC.
- 2-CONVERTING OR CHANGING EXISTING EQUIPMENT (Your own equipment or our stock)-can be done in our own shops utilizing good used or surplus new materials.
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Roots-Connersville	20 x 60	SF	234	6040
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Roote-Connersville	57	AF	3	266
Roots-Connergyille	22 x 36	RCDH	6	5500
Sutorbilt	6M	M	6	189
Roots-Connersville	10 x 12	RCD	10	510
Roots-Connersville	16 x 10	RCD	10	950
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SPECIAL -475 new Blowers, purchased in November 1952; Offered at 30% to 50% savings.

Spencer	1230	30	3,350	20
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Spencer	5060-H	75	1,700	86
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Make	Size	HP	Volume CFM	sure (az)
Sturtevant	170-225	75	10,100	13
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Spencer	1015	15	2,000	16
Spencer	1215	15	1,675	20
Ingersoll-Rand	PS-377	85	15,000	20
Ingervall, Rand	PH-377	150	10.500	20

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Make	E/	Туре	Size	Type	Wheel Diam.
Clarage		IE	15	Open	23
American		E	35	Open	23
New York		GI	33	Open	33
Clarage		IE	23	Open	36
American		ELS	55	Open	36
Aladdin		EX	42	Open	42
Sturtevant		DES 3	79	Open	49
Sturtevant		DES 1	70	88	56
	***	ATHER	C'484 6T	DOW	

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Espeniach Stainies Stael Home Mizer, connichs with a 7½ HP Explosion-Proof Meter.

Baker-Perkins 100 Gal. Stainies Steel Mixer,
deuble-arm, sigma blades, with 20 hp st.

1-1. H, Day 22, 75 Gal. Brighton Mixer,

10-Peoble Mills 40 to 50 Gal.

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HIGH SPEED Roller Mills "X4" to 10"x40".

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Sharples Super Centrifuge, #18 open type. Used about 10 hours. Motor, switches, wrenches, instruction book, included.

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NINS: 3 22. 6 x 80. 0 x 00 e x 1/29

MISCELLANEOUS EQUIPMENT

Hammer Mills: Jeffrey 36x24B, 75 HP Motor.
6 x 15 ' 4 7 x 17 ' Autoclaves.
Weighthometers 18', 30', 30', 4 42',
12' x 10' Dorreo Drum Filter.
5 x 16' x 10' Dorreo Drum Filter.
40' x 30' Dorr 3 Tray, 4 Compartment Thickener.
5 x 4. 6' x 12' x 10' Dorreo Drum Filter.
21 Haymond Automatic Pulverizer.
21 Haymond Automatic Pulverizer.
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21 x 16 x 10' x 1

New in original boxes-reasonable.

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NEW AND GOOD-AS-NEW EQUIPMENT

316 Stainless Steel Tanks, new 100, 200 & 360 gail.

—Stainless Tank #430 Chrome, vert. 7x10' dees.

—Stainless Tank #430 Chrome, vert. 7x10' dees.

—Day Mixer, steam jacketed, 50 gail. \$6 Administration of the stainless of the

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I—Rotary Dryer direct fired \$4"x30"6",

I—Kennedy-Van Saun Rotary Dryer, 4"x40",

I—Kennedy-Van Saun Rotary Dryer, 4"x40",

I—Gruendier Hammer Mill. 10 H. P.—new.

I—New Sharples Oil Purifiers.

I—316 Stainless Reactor, 255 gais. cap. jacketed.

Abbe Pebble & Tube Mill. 5 "x22"—Burr-Stone Lined.

I—Patterson Ball Mill, 5"x22"—Burr-Stone Lined.

I—Patterson Ball Mill, porcelain lined, 17"x27".

—Dopp Kettles with spitators, 600 gai. cap.

45—Steel Tanks from 100 to 100,000 gais.—both horizontal and vertical orizontal Mixers.

Robinson Pulverizer 2"20, with 2 motors 10 HP each.

Robinson Ribbon Type Mixer, 50"x10"—like new.

6—Steam Jacketed Blackburn-Smith Filters.

2—Crystalligers—10" long.

2—300 ton Hydraulic Presses.

3—3.00 gal. Jacketed Kettles with Turbo Agitators.

1—300 gal. Double Arm Mixer—jacketed.

QUALITY EQUIPMENT

AUTOCLAYES—2000 gal. jktd. 200 PSI; 75 gal. jktd., agit. 600 PSI#, 150# jkt.

BINS-11,000 cu. ft. BLENDERS-730, 310, 157, 2.7 cu. ft. BLOWERS-170 to 74,000 CFM, 0 to 14". CENTRIFUGES—Steel, 26", 30", 40". CENTRIFUGES—SS 40", 48".

CLASSIFIER-Duplex, Dorr 4'x20'. COLUMNS—Steel, 6'x49'3"x3'6" bubble cap. COMPRESSOR—151/2"x9"x10" 504 CFM 100#.

CONDENSER-1035 sq. ft. 4 pass. steel. DIGESTER—3900 gal., jktd. & agit.
DRYERS—Steam tube, Louisville 6'x35'.
DRYERS—Rotary, Vacuum, 30"x8'; 5'x30'; 7'x20' (2).

DRYERS—Double Drum, 32"x90"; 36"x84"; 42"x120"; Single Drum 5'x6'. DRYERS-Conveyor, 2'x28'; SS 8'x94'; 16'x85'.

DUST COLLECTORS-4500 CFM, Steel & SS. FEEDERS-Vibrating and Belt.

FILTERS — Rotary Vacuum, 11'6"x18"; 11'6"x14'; 8'x14'; 8'x12'; 8'x10'; 3'x4'. FILTER PRESSES-42", 36", 30".

KETTLES & REACTORS—Stainless Steel, 3000 gal.; 525 gal.; 300 gal.

3000 gal.; 525 gal.; 300 gal. KETTLES & REACTORS—Steel, 2800 gal.; 1700 gal.; 1000 gal.; Ci 1500 gal. KILNS—3'x25'; 4'x30'; 5'x30'; 5'x67'; 7'x60'; 7'x160'; 8'x125'; 9'x80'. MILLS—5-roll 50" Raymond 10'x48" Ball; 6'x8' Ball; 36'x42" Pebble; #1 Ray-mond imp.; Raymond #402 Boyl. Abbe B with Shaker; Williams #3.

MIXERS-Readco, Champion, Blystone, PACKAGING—Fillers, wrappers, labelers. TABLET PRESSES—Colton 3DT, 200RP, 2RP.

NKS—Aluminum, Steel, Sta. Steel, Lead, 500 to 135,000 gallon cap. Pressure, 1300 to 23,000 gal., to 600 PSI.

SPECIALS

Sharples Nozljector, #DH2, SS, complete.

Sharples Super-D-Canter, #PY14, SS, complete.

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GLASS LINED TANKS — USED — 3000 gallon capacity, Welded construction — Fully insulated. Equipped with manhead, Suitable for milk, food products, lily white chemicals, solvents and fine lacquers.

VARNISH TANKS — USED 54" diameter x 14'6" high (or long) 4" Steel — Weld-ed construction — 1700 gallons.

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DRYERS-KILNS

- -Reeves 7'x160', 7'x120', % " shell. -Vulcan 8'x125' ¾ " shell. -Allis Chalmers, 9'x80', % " shell. -Link Belt 7'x45' ½ shell. -F. L. Smidth 4'x30' ¾ " shell.

- Ruggles Cole 5'x30' Rotary Dryer.
- -Auggies Cole 3 x36 Kotray Dryers Rotary Dryers 7'x60', 5'x67', 5'x40', 4'6"x50', 4'½'x30', 4'x30', 4'x20', -Link Belt, Hersey Rotary Dryers 2'7"x8', 3'x24', 3'10"x16', stainless and steel. -Hersey, 6'x23', 5'x23' Rotary Dryers.

- 4—Louisville steam tube Dryers 6'x50', 6'x30', 5'x28', 3'x20'.

 4—Devine single door vacuum Shelf Dryers having 20, 14, 6 and 4—40"x43"
- Stokes and Buflovak Rotary Vacuum Dryers 30"x8', 3'x15', 5'x30'. Single Drum 4'x9' Flaker.
- Buflovak double drum 60"x144", 42"x 90", 36"x84", 32"x52". Buflovak 32"x52" double drum 316 SS.
- 1—Devine 2'x4' single drum Vacuum SS. 2—Buflovak 6' dia. Crystallizers.

- 1—Oliver 1'x1' Rotary-Vac Filter 316 SS. 2—Oliver Monel 8'x10' Rotary-Vacs.

- Oliver SS 8'x10' Rotary-Vac.
 -Eimco 4'x5' Rotary-Vacs complete with
- pumps, drives, piping, etc. Oliver 5'3"x3" Rotary Vacuum Enclosed
- Precoat.

 —Oliver Rotary Vacuum 11'6"x18', 11'6"
 x14', 8'x12', 8'x10', 8'x8', 8'x6', 3'x1'.

 —Feinc steel 8'x12' Rotary-Vac.

 —Sweetland #12 with 72 and 36 leaves.

 —Sweetland #7 with 27 leaves.

 —Niagara #110-20 Pressure Filter 316

- Sparkler #18-D-12 Pressure Filter SS. -Vallez 500 sq. ft., Rotary Pressure. -Sperry 36" Recessed, 48 chambers. -Shriver 36" P&F 42 chambers.

- -Shriver 35" P&F 42 chambers,
 -Sperry 24" P&F, 16 chambers,
 -Shriver 24" Recessed, 30 chambers,
 -Shriver 18" Recessed, 30 chambers,
 -Sperry Aluminum 30" and 24" P&F.
- -Shriver rubber covered 30" P&F.
- 10-Shriver, Sperry Filter Press Skeletons 42", 36", 30", 24", 18".

CENTRIFUGALS

- I-Fletcher 40" Suspended, Stainless Steel.
- -Bird 40" Suspended, rubber covered.
 -Tolhurst 32" Suspended, rubber covered.

- ered.
 1—Fletcher 30" Suspended, steel.
 1—Folhurst 26" Suspended, steel.
 2—Tolhurst 30" center slung steel.
 1—Bird 36"x50" solid bowl, stainless.
 4—Bird 36"x72", 36"x50", 18"x28" solid bowl, continuous bowl, continuous.
- Sharples #16P Monel and SS Super

PULVERIZERS—CRUSHERS

- 4-Hardinge Mills 41/2'x16", 5'x22', 5'x
- 36", 6'x22". -Bayer 36' Attrition Mill 2-50 HP mtrs.

- -Bauer 36' Attrition Mill 2-50 HP mtrs.
 -Abbe 5'x8'6" silex lined continuous.
 -Patterson 6'x8', 5'x6', 4'x5', 2\/2'x3\/2'
 brick-lined Pebble Mills.
 -Abbe 3'x4', 3'x3\/2' Pebble Mills.
 -Premier Colloid Mills 8" dia., SS.
 -Eppenbach QV-8 Colloid Mill 2 HP motor.
- -Jeffrey 30"x24" Hammer Mill, Type A. Raymond #1 Impact Mills with 5'6" dia. double whizzer separators, cy-clones, tubular collectors and piping. Raymond, Gayco Separators 12', 8' and
- 4—Mikro #1SI, #1SH, #2DH, #2TH SS. 2—Sturtevant 5"x8" Roll Crushers.

SPECIALS

- -Link Belt 705-20 Roto-Louvre Dryer, 316 S.S.
- —Pfaudler 1000 & 500 gal. glass lined jacketed agitated Reactors.
- Baker Perkins 200 gal. double arm jacketed vacuum Mixer 75 HP
- 1-Raymond 5 Roll High Side Mill.
- 1-#2TH Mikro Pulverizer, S.S.
- -Buflovak 32" x 52" Double Drum Dryer, 316 S.S.
- -Sharples Super-D-Canter PY-14, 316 S.S., 10 HP motor.
- Sharples Nozljector DH-2, S.S., 15
- -Patterson 40" x 84" Gyratory Sifter, single deck 5.5.
- 1—Sharples C-27 Super-D-Hydrator S.S.
- 8—Vertical steel Storage Tanks 10'6" x 31'6".
- -Devine 2' x 4' Vacuum Drum Dryer, 316 S.S.
- -2800 gal. Horizontal Tank with coils, 316 S.S.

SCREENS—CONVEYORS

- 1-Patterson single deck 40"x96" SS.
- 5-Stainless single deck 40"x84".
- #42 Rotex double deck 40"x84"
- #12 Rotex double deck 20"x48".
- Tyler Hummer 3'x5' triple deck.

 Tyler Hummer 4'x15', 4'x10', 3'x10',
 3'x5', single deck with V-16 Vibrators.

 Allis Chalmers 2'x6' and 2'x4' Aero-
- -Abbe #2 Blutergess Sifter.
- 100 feet 9" and 12" screw conveyor.
- -Bucket Elevators, steel housing 34' to 60' centers, 8"x5", 10"x6" buckets.



ANNOUNCEMENT!!

Contact us for your designing and fabricating work from single items to complete plants. We specialize in construction of all types of Tanks, Kettles, Reactors, Condensers, Evaporators, Stills, etc., in all metals in accordance with ASME and National Board up to 1½" plate. Send us your inquiries.

MIXERS

- -Baker Perkins 200, 100, 50, 1 and 1/2
- gal. sigma blades, jacketed. Baker Perkins 50 gal. JEM, 50 HP.
- Baker Perkins, 35 gal. SS jcktd.
- Day Jumbo 6000# SS Powder 40 HP.
- Robinson 4000# steel powder. Rodgers 400 to 3000# powder.
- New Portable Agitators 1/4 to 5 HP. 4-Day, Ross 8 and 50 gal. Pony.

KETTLES-STILLS CONDENSERS-TANKS

- 2-Pfaudler Reactors glass lined 1000 and 500 gal.
- Buflovak, Zaremba and Kilby Evapora-
- tors 300 to 14,000 sq. ft. -Lummus 4' dia. Steel Bubble Cap Col-
- 4' dia. Bubble Cap Column, copper and stainless. Heat Exchangers, SS 50 to 130 sq. ft.
- -Buflovak Condensers 20 to 90 sq. ft. -Groen 125 gal., SS, jcktd., agitated

- -2800 gal. 316 SS Tank with coils. -2300 and 1400 gal. Aluminum Tanks. -Haveg Storage Tank 4000 gallon.
- Glass-lined Storage Tanks 6000 and 8000 gals.
- 1-Rubber lined Storage Tank 8'x30'.

MISCELLANEOUS

- 7—Stokes Vacuum Pumps 10 to 100 CFM. 8—Stokes DD2, B82, D4, D3 and B2, Rotary Tablet Machines. 5—Nash T\$12, T58, L3, AL672, #4
- Vacuum Pumps. Olivite, Durion rubber and stainless steel Centrifugal pumps 6" to 1".



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 1-48" x 40" Buflovak single drum flaker
 2-24" x 36" & 32" x 52' double drum
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 shelf, 17 & 13 shelves
 1-416 sq. ft. Devine #26 double door, 15—
 59" x 78" skelves
 4-4 ' x 27' Beard oil & gas burners, complete

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- closure 2-18D8 Sparkler steel, with pumps and
- motors
 13-24", 30", & 32" Shriver & Independent,
 wood pletes and frames
 2-54" x 6' Oliver rotary vacuum, wood &
 steel, complete with all accessories

REACTORS AND KETTLES

- 2-800 gal Pfaudler glass lined jacketed and
- agitated
 1-300 gal Pfaudler glass lined jacketed and
- coiled 316 stainless jacketed and coiled, 3 HP turbine agitator 2-250 gallon Blaw Knox steel jacketed and agitated, 300 psi internal, 1002; jacket 4-300 gallon 316 stainless jacketed and agitated.

MIXERS

- 2-3000# Artisan jacketed dry powder 3' x 10' x 4', center discharge 18-100#, 400#, 600#, 800#, 4000# & 7500# dry powder, double ribbon, Day
- 3-100 % over powder, double ribbon, Day & Wolfe
 3-100 & 500 gallon Baker Perkins double orm, heavy duty, jacketed
 4-#6 & #2 Day Cincinnatus unjacketed, sigma blade

MILLS AND GRINDERS

- 1-151 & 2DH Mikro steel with motors 2-14 & 25 gallon Abbe pebble mills, belt

1—12,000 gallon stainless vertical closed 2—7200 gallon 9' x 15' stainless steel 1—1000 gallon Haveg vertical, closed 1—750 gallon lead lined, coiled

- 5-3' x 8' & 2' x 8' Tyler Niagara stainless
- single deck 1—40" x 78" single deck Roball, motor
- driven
 1-20" x 48" Roball single deck, bronze,
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 1-30" x 30" Allis Chalmers Model 441,
 gyratory

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 1—Sweetland #12 Filter, Brze Leaves.

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 1—S.S. Tube Condenser 368 Sq. Ft.

 1—Bird 48" S.S. Sus. Centrifuge.

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 3—Roball Screens to 40" x 120".

 3—Bubble Cap. Alum. Cols. 27" & 36".

 2—Rubber Lined Tanks 3,500 Gal.

 4—Rubber Lined Tanks 39,000 Gal.

 1—Devine 20 Shelf Vac. Dryer.

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3705/L7

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Stainless Autoclave 5' x 12' with agit-

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Stainless Autoclave 5° x 12° wire egnator
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with egitator
with egitator
with egitator
Two Pfaudler 5.5 Jacketed Stills; 13° x 15° Jacketed, Agitated
Two Pfaudler 5.5 Jacketed Stills; 13
gal. and 28 gal.
Stainless Heat Exchanger Shells; 14½°
x 47° and 24° x 72°; closed heads
10° x 30°; 50° Stil Internal; 75° PSI Jacket
Doppley 50 gal. Jacketed Reactor; 40°
diameter 1705/L5 3549 3662 2879 x 47° and 24° x 72°; closed heads
Glass Lined 59 gal. Jacksted Roactor;
10° x 37°; 50° P51 internal; 75° P51 Jackst
Dopplay 50 gal. Jacksted Roactor; 40°
diameter
50° Roactor 2′ x 4′ with 5′ 5′
Turbine Type Agitstor
Plaudler 150° Gal. 3′ x 3′ Glass Lined
Reactor; Jacksted 5′ P51; manhole
470° Gal. 7′ yea 316° Stainless Jacksted
Tank; 4′ x 5′ with 5′ x 91; manhole
170° Gal. 6′ x 91; manhole
170° x 91° x 15′ x 15′ x 91; manhole
170° x 91° x 15′ x 15′ x 91; manhole
170° x 91° x 15′ x 15′ x 91; manhole
170° x 91° x 15′ x 15′ x 91° x 91° x 3564/E26 3168/D7 RADAMA 1424/859 3168/D13 3544 3273/E2 1052XL 1851/51 3799/V1 3762/L1 3762/L7 3762/L12 3771/1 3430 3413 3799/V2 3483W 2470 3557 3382 3505 3748 3773]

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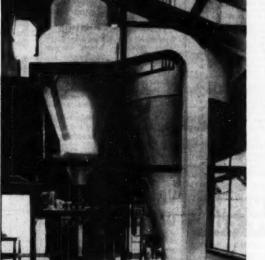
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1-ROTARY CUTTER, No. 21/2 Ball

BUTANE TANK, 16,000 gal.,

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2-OINTMENT MILLS, Day, 18", ss.

5-FEEDERS, Model F22 Syntron Vibro-Flow, with controls. (new)

2-KETTLES, 50 gal., ss., Steam

Agitators. (new)

Jacketed, with Double-Acting

-EVAPORATOR, Buflovak ss., 163

with photocells. (new)

sa.ft. (new)

& Jewel. (new)

125 psi. (new)

ss. (new)

(new)

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This is a complete unit with a special 3,200,-000 BTU scroll type air heater, designed to operate with natural gas. The Dryer is of mild steel construction.

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 48" Tolhurst susp. steel peri.
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- -60 sq. ft. 316 SS Single Effect.

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 -Zaremba trip. eff. Evap., 850 sq. ft.

 -Swenson trip. eff. Evap., 850 sq. ft.

Filtration Equipment

- Oliver Filter 1x1', 316 stain, steel.
 Cast Iron recessed and plate and frame
 Filter Presess, 7" to 36"
 Aluminum 30" 40-chamber P&F. press.
 -Lead 24" 38-chamber P&F. press.
 -Oliver 8x14' Filter.

- Oliver pressure, iron, 110 sq. ft.
 Alsop, Lomoz internal pressure Filters,
 stain, steel and bronze.

- MILLS

 1—Hardinge 36" x 5' continuous Pebble
 Mill.

 1—Jeffrey 35 hp. Hammer Mill.

 1—Williams 518 No-Nife Hog.

 1—Williams 1910 AK 40 hp. Hammer Mill.

 3—Mikro Pulverizers: #15H, 15I.

 1—Attrition, Sprout-Waldron 20".

 12—Pebble and Jar Mills, 1 to 235 gal.

 5—Colloid Mills and Homogenizers.

 13—Raymond 5-roll high side.

 14—Hammer Mills, 34 to 50 hp.

 8—3-roll Mills, Day, 12x32" and 16x46".

MIXERS

- States, dbl. act. agitators.

 1—Day 1 bbl. stain. steel, single arm, jacketed, vacuum cover 3 hp.

 2—Day Pony Mixers, 46 and 15 gal.

 1—Abbe Lenart 5 and 110 gal.

 1—Colton #6 s.s. Granulating.

 1—Readco 250 gal. work. cap. stain. steel dbl. arm. 36 hp.

 7—Baker-Perkins, Read, Lynn-Superior double arm. up to 100 gallons.

 10—Day, Robinson Powder type, 50 to 2000#.

TANKS

- 30—Stainless Steel (some with agilators). new and used, up to 10,000 gal. 2—1000 gal. steel jacketed (100 psi.) open

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Screens: Rotex, Selectro, Tyler-Hummer. Heat Exchanger: Karbate 16.5 sq.ft. Vacuum Pumps: Stokes 105 CFM. Sanitary Pumps: Waukesha size 55, 100.

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B & P 1 & 2.25 gal. jkt. mixers Buflovak Double Drum Dryer-32" x 52" complete

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12" to 36" P & F or REcessed Filter Press In Stock At All Times: New & Used Kettles 2½ to 1000 gallon S/S or plain steel.

Abbe Lenart Mixer—5 gallon capacity. S/S
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Wallace-Tiernan Chiernic Enaporators. A-4'4
Farrul-Birmingham Distructor, 3'y',2'4' sheet
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Neitherden Stale, 1000 z enclosed type
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Hardinge Conical Ball Mill 10' x 48"
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Crusher

Crusher
Link Belt Screw & Belt Conveyors
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Dorr, Morris, Worthington process

pumps Research Corp. Electrostatic Precipi-

The above items include all auxiliary equipment with individual motor and control 220/440/3/60. The equipment may be inspected on foundations.

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36" x 84" Overton Double Drum Dryer.
50 to 200 gal. S.S. Mix Tanks, water jkt.
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Bowen S8 Spray Dryer, model BE37, lab size 32" x 32" electrically heated, complete unit Buffowk at 12 Vac. Dryer, 40 x 42 shelves General American 42" x 120" twin Drum Dryer Spiral Blenders, all sizes and metals, new & used Koch Electric Oven. 12 shelf, #Y651, 36" x 40" x 60", complete unit, like new Sperry Iron 18" filtergress, 10 jktd. chambers Mikro Pulverizers, Bartom =1-2-3 & 4 Dodger having Falk Drive & 20 HP AC metor 2—AT&M 60" Centriluyal Extractors, 316 SS link supended with 10 HP AC metors.

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AT&M Heavy Duty Mixers or Churns, Battery of 3 size 3' x 6', 300 gai. ea. with 25 HP Exp. motor

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-Stokes Rotary Tablet Machine, Model #DDS-2 -Tolhurst Rubber Covered 40" Suspended type Centrifuges

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-De Laval 17" Multi-Matic Stainless Steel Centrifuge.

-De Laval 17" Multi-Maric Stainless Steel Centringe.
-Pfaudler glass lined jacketed vacuum Reactor, Series P, 30 gallon capacity with drive and agitator.
-Pfaudler glass lined jacketed vacuum Reactor, 500 gallon capacity, 75 PSI jacket, 40 lbs. internal pressure.
-Swenson Walker type 316 Stainless Steel Jacketed Crystal-

lizer. 4-10' Sections. Sparkler Type 316 Stainless Steel Jacketed Filter, Model

33-D-17.

-Sparkler Stainless Steel Jacketed Filter, Model 18-D-8. -Bird-Young Stainless Steel Filter, 3' x 3'.

Niagara Stainless Steel Filter, Model 136-46.



THE GELB GIRL - MARCH, 1954

DRYERS-KILNS

Buflovak Vacuum Double Dryer, 24" x 48".

1—Stokes Rotary Vacuum Dryer, 3' x 12'.

1—Vulcan Rotary Kiin, 7' x 120'.

1—Buflovak Double Drum Dryer, 32" x 90".

1—Louisville Steam Tube Dryer, 6' x 50'.

2—Buflovak Vacuum Drym Dryer, 24" x 20".

1—Devine Rotary Vacuum Dryer, 5' x 25'.

1—Buflovak Double Door Vacuum Shelf Dryer, 28 shelves each.

1—Louisville Experimental Laboratory Dryer, 12" x 71%'.

12" x 7½'.

9—Devine Vacuum Shelf Dryers, 5, 9 and 10 shelves.

FILTERS

Filter.

1-Schriver Stainless Steel Filter Press, 24" x 24", Closed Delivery, 10 chambers.

1-Sperry 42" C I Plate 6 Frame Filter Press, 16 Chambers, Closed Delivery.

5-Sweetland Filters, #2, 5, 7 and 12.

1-Oliver Rotary Steel Filter, 3' x 1'.

CENTRIFUGALS

Tolhurst Solid Curb S.S. 26" Perforated Basket Centrifuge with Explosion Proof

Basket Centrifuge with Explosion Proof Mir.

Fletcher Stainless Steel Suspended Type Centrifuge, 40" Perforated Basket.

A. T. & M. Stainless Steel Susp. Centrifuges, 48" Imperforated Baskets.

Sharples #16-Y Stainless Steel Super-Clarifying Centrifuges.

Ellis Stainless Steel Centrifuge with 30" Perforated Basket.

Type 304 Stainless Steel 132 sq. ft. Heat Exchanges.

Sharples Type 316 S.S. Super-D-Hydrator, Model No. C-20.

MIXERS

-Baker Perkins Stainless Steel Jacketed
Double Arm Mixer, Sigma Blades, 9 Gals.

1—Baker Perkins Stainless Steel Dispersion Mixer, Size 15, Type VUMM, 100 Gals. 5—1-H.P. Explosion Proof Gear Head Mixers with Stainless Steel Type 316 Propellers & Gald, 445 BDM.

5-II-P. Explosion Proof Gear Head Mixers with Stainless Sieel Type 316 Propellers & Shaft, 445 RPM.

1-Struthers Wells Double Arm "Northmaster" Mixer, 50 Gals, Working Cap., 100 Gals. Total Cap.

5-Simpson #0 Intensive Mixers.

1-Simpson #1 Intensive Mixers.

1-Simpson #1 Intensive Mixers.

3-Baker Perkins Steel Jacketed Mixers, Sigma Blades, 100 Gals.

3-Baker Perkins Stainless Steel, Jacketed Mixers, Sigma Blades, 100 Gals.

3-Turbo Steel Jack Mixers, 700 Gals. Each.

1-J. H. Day Steel 50 gallon double arm Sigma Blade Mixer.

PULVERIZERS—GRINDERS—MILLS

1-Abbe #00 Rotary Cutter with 3 HP Motor.

1-Mikro #3TH Mikro Pulverizer with 30 HP Motor.

-Mikro #3TH Mikro Pulveriser with 3u nr Motor.
-Mikro #3W Pulveriser.
-Mikro #3TH Pulveriser. Stainless Steel & Bronse Construction with Motor.
-Abbe #2 Master Rotary Cutter.
-Ball & Jewel #0 S.S. Rotary Cutter.
-Ball & Jewel #2 Rotary Cutters.
-Ball & Jewel #1 Rotary Cutters.
-Blow Kaox Air Mill Pulverire.
-Mikro Stainless Steel Atomiser #6.
-Tropp 2-Roll Rubber Mills, 18' x 50".
-Abbe #2 Buhrstone lined Pebble Mill, 5' x
4'.

Gruendler #24-40 Hammer Mill. Kent Laboratory 3 Roll Experimental Mill,

4" x 8". -ISH Micro Pulverizer.

AUTOCLAVES—KETTLES—TANKS
—Stainless Steel Crystallizing Tank, 6,000

Gallons. Plaudler 500 Gallons jacketed Vacuum

Plaudier 500 Gallons Jacketed Vacuum Reactor.
Combustion Engineering Stainless Steel Jacketed Autoclave, 500 Gals, 300 PSI.
Plaudier Glass Lined Jacketed Vacuum Reactors, 200 Gal. sach.
Plaudier Glass Lined Jacketed Reactor with Anchor Type Agitator & Drive, Unsed, 500 Gallons.
S.S. 200 Gallons.
S.S. 200 Gal. Jacketed Vacuum Reactors, 450 Gal. Stainless Steel Jacketed Kettle.
Struthers Wells Steel Jacketed Vacuum Reactor, 1300 Gals. Cap. with Drive, Turbine Agitator & Coils.

Buflovak Type 347 Stainless Steel Rotary Vacuum Dryer, S'x 20'.

Baker-Perkins, Steel Jacketed Double Arm Sigma Blades, 200 gallon working capacity. Year built 1948.

Link Belt Steel Roto Louvre Dryer, 7½'x 20'.

Radco Type 316 Stainless Steel Jacketed Powder Mixer, 1,000 ib. capacity, 125 PSI, ASME.

2,800 gallon type 316 Stainless Steel Harizontal storage tank with coils.

Readco Type 316 Stainless Steel Powder Mixer, 1,000 gallon capacity.

Hootar Stainless Steel Vacuum Reactor, 500 gallon capacity.

12—Koven Stainless Steel Jacketed Vacuum Kettles, 380 Gals. Cap. Each. 1.—Monel Storage Tank, 1,300 Gals. 2.—Blaw Knox Steel Jacketed Autoclaves, 300 6 500 Gals. P.S.J. Working Pressure 500

6 500 Gals. P.S.I. Working Pressure over lbs.

1-Patterson Steel Jacketed Autoclave, 900 Gals. Cap. Internal Pressure 120 lbs.

1-Artesian Steel Jacketed Kettle, 1,000 Gals. Cap. with Rake Type Agitator, ASME Code, 50 lbs. Pressure.

2-I.P. Devine Jacketed Vacuum Reactors, 2,000 Gals. Cap. Each.

Buffalo Steel Pressure Tank, 10,000 Gals. Cap. 125 P.S.I. ASME Coded.

25-Steel Storage Tanks, 9,000-17,500 Gals.

1-Steel Rubber Lined Storage Tank, 4,500 Gals. Cap.

6-Haveg Storage Tanks, 500 & 2000 Gal. Cap.

Cap.

Cap.

2—Plaudier Glass Lined 100 Gal. Storage
Tanks, Type VR-100,

3—Glascole Glass lined Vacuum Receivers,
25 & 30 Gal. Cap.

MISCELLANEOUS

2—Downington Stdinless Steel Heat Exchangers, 500 Sq. Ft. Each.

1-Watson Stillman Hydraulic Press, 12" x
12", 30 Ton.

1-Nash Hytor Vacuum Pump, Model #H-4 with 23 HP Motor.

1-Roots Connorsville Blower, Model #HD, Size 16" x 12".

3-Nash-Hy-Tor Vacuum Pumps Model No. T.S.-12.

T.S.-1

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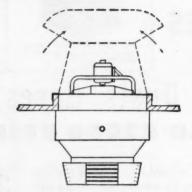
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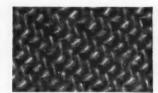


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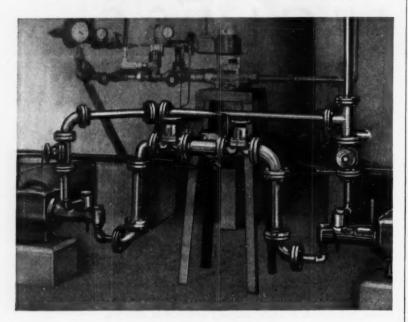
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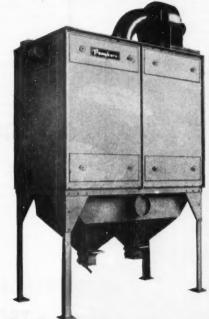
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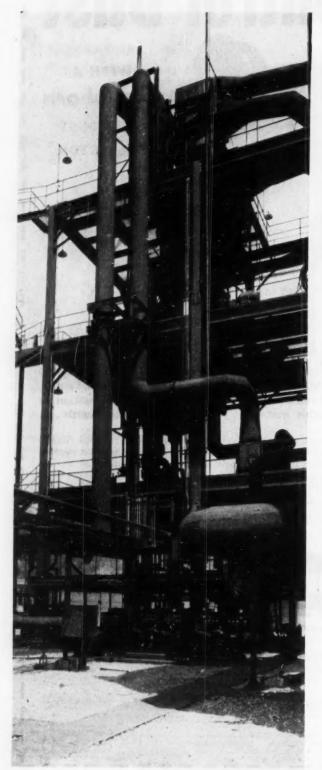
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Chemicals

	Chemicals
Acid, Fumaric 462A	Outlines typical reactions which indicate the chemistry of fumaric acid and the nature of some of its reaction products. Offer complete details in Bulletin C-102. Monsanto Chem.
Acid, Salicylic 141a	Major producer of salicylic acid and salicylates assures the quality, quantity and form required. Shipped in fiber drums, 25 to 250 pounds net. Offer technical information. Heyden Chem.
Acids, Fatty 462B	Data on new structurally modified fatty acids. Includes characteristics, properties, effects of their unconventional behavior in finished prod- ucts. Bulletin 50. Emery Industries.
Alcohol, Furfuryl 389	Derived from agricultural residues & useful in manufacture of wide variety of products which include resinous mortars, cements, binder resins, textiles, etc. Bulletin 205. Quaker Oats.
Alcohol, Myristyl 462C	Company makes available literature (new technical bulletin) which contains pertinent information on the uses and specifications of myristyl alcohol. Aceto Chemical Co.
Alumina, Activated 462D	Illustrated, 48 p. includes data on grades, com- parative desiccating properties, physical charac- teristics, applications, adsorptive efficiency, etc. Aluminum Company of America.
Aluminum Chloride, Anhydrous 163	Four sizes for almost every processing need: fine grind; extra fine grind; coarse grind; coarse screened. Offers Data Sheet. Bulletin 100 covers products & services. Hooker.
Biochemicals 462 E	Information on over 600 products for research in fields of biology, microbiology, bacteriology, biochemistry & nutrition, in new GBI Reference Catalogue. General Biochemicals.
Catalysts 462 F	Leading manufacturers of catalysts, adsorbents, desiccants & other chemically treated materials offers booklet describing chemical applications of company products. Filtrol.
Catalysts 86	Manufacturss to specification dozens of catalysts for many different & complex manufacturing process-hydroforming, alkylation, dehydrogenation, etc. Harshaw Chem. Co.
Chlorobromo- methane 462G	Latest information on this new fire extinguishing agent. Covers data on properties, history, suggested uses, etc. in Product Information Bulletin. American Potash & Chemical Corp.
Cleaners, Emulsion 462 H	Describes new emulsion cleaner line. Includes emulsion cleaner reference chart with data on specific industrial uses, methods of application, safety, etc. Literature A-106. Turco.
Defoamers L396	Versatile, efficient defoamers save space now wasted on foam, cut processing time, eliminate waste & fire hazard of overflowing foam, etc. Offers descriptive data. Dow Corning Corp.
Emulsifiers, Pesticide 4621	Information on a modified versatile type of perticide emulsifier for toxaphene, chlordane, malathion plus DDT, and certain herbicides in Technical Bulletin 39. Emulsol.
Ethyl Silicates 462J	Data on commercial grades—tetraethyl o-Sili- cate, condensed ethyl silicate, and ethyl silicate 40. Properties, specifications, applications, etc. Bulletin F-7250. Carbide & Carbon.
Flatting Agents, Alkyd-Urea 245a	Alkyd-urea flatting agents for synthetic finishes Also data on Syloid AL-1 (prevents pressure build-up in metallic paints). Use, properties, etc. Davison Chemical Corp.
Filter Medium 462K	Data on pure porous Kel-F, a new filtration medium fully resistant to all strong acids, caustics oxidising agents & common organic solvents, in Brochure T-103. Porous Plastic Filter Co.
Glucurono- lactone 462L	Glucuronolactone important in biochemistry & now readily available for study & use. Offer informative booklet covering properties & clinical aspects. Corn Products Refining.
Glycerine 82	Glycerine-based alkyd resins, in white baking enamels for refrigerators, ranges & other ap- pliances, impart qualities of durability, adhe- sion & gloss. Glycerine Producers' Assoc.

Herbicides 307a	Superior formulations for cotton weed control. Repeated demonstrations indicate they are the safest compounds available. Many promising uses. CIPC Bulletin. U. S. I. Chemicals Co.
Leavening Agents 462M	illustrated, 22 p. discusses suggestions on proper use of leavening agents in prepared mixes, senf- rising flour & other applications. Technical data on full line. Monsanto.
Methyl Amyl Acetate 462 N	Includes physical & physiological properties specifications & shipping data, resin solubilities performance in ntrocellulose lacquers, etc. in Bulletin F-6264. Carbide & Carbon.
m-Phenois 4620	Mixture of reactive cresols, xylenols & ethy phenols produced by coal hydrogenation. In- cludes physical properties, typical analysis & net container contents. Carbide & Carbon.
Polybutenes 462P	For quality improvement & cost reduction of calking & sealing compounds. Other uses in adhesives, surgical & industrial tapes, rubber products, etc. Bulletin 12. Indeil Chem.
Resins, Ion Exchange 369	Chemically and physically stable for long life at top efficiency. Two anion exchangers are available to meet conditions of water supply Data on silica removal. National Aluminate.
Resins, Polyester 462Q	Presents 20 p. illustrated brochure covering complete line. Covers data on properties and production techniques, and suggests various applications. Celanese Corp. of America.
Salicylamide 462R	Effective analgesic of wide compatibility & good stability in pharmaceutical preparations. Properties, specifications, pharmacology & toxicology, etc. in Bulletin O-112. Monsanto.
Salicylamide 4628	Summarizes important detailed pharmacologica data on salicylamide—a highly effective anal- gesic & fever reducing drug. Includes prop- ertles in 26 p. booklet. Heyden Chem. Corp.
Sequestering Agents 462T	Superior iron chelating properties overcome trace iron problems, in addition to sequestering calcium & other metal salts to degree never before attained. Refined Products.
Sodium Sesqui- silicate 462U	Data on properties & uses. Evaluations of sodium sesquisilicate with respect to basic deter- gent properties of wetting, emulsification, dire suspension, etc. Phila. Quartz.
Surfactants 462V	74 p. brochure, "A Guide to Formulation of In- dustrial Emulsions with Atlas Surfactants," on how to choose & use surfactants for general industrial applications. Atlas Powder.
Wetting Agents 462 W	Results of recently completed tests & experiments of wetting agent, Udet F, conducted by prominent fertilizer manufacturers, are available in Bulletin 57. Universal Detergents.

Process Equipment

Absorbers, Impervious Graphite 462X	Offers data on four types of HC1 absorbers: falling film; packed tower; jacketed tower; internally cooled tower. Illustrated, 8 p. Catalog AB-500. Falls Industries, Inc.
Brush Strips 357	Can be coiled or twisted into many shapes. It can be formed to give intermittent or contin- uous brushing action. Adapts to stationary or power driven applications. Fuller Brush Co.
Caps, Bubble B373	Offers huge compilation of engineering data. Contains complete specification information for over 200 standard styles of bubble caps & risers. Bulletin 21. Pressed Steel Co.
Centrifugals 351	Automatic electric drive centrifugals designed for efficient, economical operation. 48" x 30" basket—1290 R.P.M. Cites features & describes other basic models. Western States Machine.
Centrifugals 358	Combine filtering & dehydrating with no loss in time. Includes data on separation, extrac- tion, clarification, impregnation, draining, etc. Illustrated. American Tool & Machine.
Centrifugals. Continuous 346	Feature Vari-Beach drive which allows instantaneous change of beach speed from 0 to 300 inches per minute. Details of other features in new bulletin. Tolhurst Centrifugals Div.
Centrifuges 462Y	Illustrated bulletin on push & scraper type centrifuges covering range of application, methods of control, simplicity of design, economy of operation. Cleaver-Brooks.
Clariflers 462Z	Offer continuous, economical operation, more efficient removal of suspended matter from solution, minimum of operating supervision, etc. Illustrated. Graver Tank & Mfz. Co.

Classiflers, Air 463A	For use in continuous separation of coarse & nne air-borne particles. Covers operational de- tails & advantages over conventional types. Illustrated Bulletin AH-449. Hardinge Co.	Dust Fitters 388	reature constant suction at dust sources, self cleaning for continuous operation, no auxiliary motors or blowers, no abrasion of bags by cleaner, etc. Bulletin 102. W. W. Sly Mfg.
Collectors BL442	Provide emcient removal of air-borne contami- nation (dust, fumes, vapors, acid gases & odors) & recovery of product thru muttiple washing action. Builetin 551. Claude B. Schneible.	Evaporators M430	Provide evaporation as low as 45° F. & complete recovery of condensers. Operating costs 27%-55% less than steam evaporators. Offers detailed information. Mojonnier Bros.
Columns, Glassed Steel 474	Resistant to all acids (except HF) and also to alkaline solutions up to pH 12 at 212°F. Built to standard column diameters of 2" to 48". Data in Bulletin 894-A-3. Pfaudler.	Feed Systems, Chemical 463H	Outlines several packaged chemical feed systems for various requirements of water treating ap- plications. Includes data on accessory equip- ment. Bulletin T-1153. Phila. Pump & Machy.
Columns, Water 463B	Description, specifications, principle of operation & features assuring positive alarm signals if boiler water falls too low or rises too high, in New Data Unit 232. Jerguson Gage.	Filters BL403	Data on pyrogen & bacterial retentive filters. Provide for double filtration, easy to set up & clean. precision machined, compact & portable, etc. Bulletin 8-4EL. Ertel Engrg.
Conditioners, Air, Pulpit 463C	For use in industrial control areas where heat, dirt, or fumes create hazardous working condi- tions. Mechanical features, capacities, dimen- sions in Bulletin 1307. Dravo Corp.	Filters 433	Makes available 4 filter catalogs—Industrial, Aviation, Automotive and Fleet. Describes the many types of filters for various industries. Illustrated. Purolator Products.
Converters, Dry Ice L398	Dry ice converters are A.S.M.E. code pressure vessels especially adapted to charging with full 50-lb. cakes of solid CO ₂ . Feature no operating costs. Dry Ice Converter Corp.	Filters, Automatic 4631	Designed for large air volume and high efficiency. Includes features, specifications, engineering and performance data in illustrated, 12 p. Bulletin 500. Dollinger Corp.
Crushers, Jaw L430a	Company line of jaw crushers features steel frames, anti-friction bearings, manganese steel liners. Size: 5" x 6" to 32" x 40". Offers technical bulletin. Denver Equipment.	Filters, Deep Bed 172	Efficiency of deep bed fliters is found to be nearest approach to electronic precipitation ever attained with mechanical air filtration. Data in Bulletin 233. American Air Fiters.
Demineral- izers 463D	Describes 8 different processes of demineraliza- tion including Un-A-Bed one tank demineralizer & silica & CO ₂ removal by ion exchange. Bulletin DM. Hungerford & Terry.	Filters, Pressure Leaf 223	Give easy recovery or disposal of as much as 150 cu. ft. of solids at a time. Filter liquids to clarity at rates up to 45,000 G.P.H. Offer Catalog NC1-53. Niagara Filters Div.
Demineral- izers 463E	Covers mixed-bed, 2-bed & 4-bed demineralizers for laboratory, hospital & industrial use. Ex- plains principles, construction, operation. 20 p. illustrated Catalog 127. Barnstead Still.	Filters, Sand L405	Filter cleans itself—automatically—with no in- terruption to the filtering operation. May be used for plant supply water or waste water treating. Bulletin 46-A-11. Hardinge.
Demineral- izers R403	Variety of mono- and multi-column models (flow rates from 10 to 10,000 gph). Equipped with regenerant tanks and necessary gages, flow meter, etc. Descriptive Catalog. Penfield Mfg.	Flakers 332	Produce granular or flaked material from caustic soda, asphalt, DDT, benzine, etc. Offer contin- uous operation, large capacity, product free of lumps. Catalog 352. Blaw-Knox Co.
Demineral- izers 463F	New line of mixed-bed water demineralizers features latest engineering developments in ion- exchange process of water purification. Details in Bulletin 126. Barnstead Still.	Generators, Inert Gas 53	Help meet purging or blanketing problems. Com- plete with the latest fire checks and safety devices. Full details and technical information in Bulletin 1-10. C. M. Kemp Mfg. Co.
Disintegrators 376a	For efficient, high-capacity particle size reduction on wet, moist, or dry services, 360° screen increases capacity, reduces power consumption, minimizes plugging. Rietz Mfg.	Kilas, Rotary 169a	Efficient thermo-processing of products. Used in production of lime, bauxite cement, sodium silicate, alumina, etc. Design features in illus- trated Bulletin 1115. Traylor Engrg.
Dissolvers L432	Rugged, fast loading, high-speed units greatly increase dissolving capacity without using more working area. Impeller operates at velocities up to 7,500 f.p.m. Cowles Co.	Kilns, Rotary 154	Parts are precision designed & built to give maximum protection against mechanical troubles of all kinds. Includes application data in illus- trated Bulletin A-442. Vulcan Iron Wks.
Dryers 70	Drying air, other gases and organic liquids to precise, low conditions meet needs of industry and science. Covers description of function and operation. Pittsburgh Lectrodryer Corp.	Mills, Bull L430c	Builetin on steel head ball mills. Feature cast steel heads, cut tooth gears, protected trunnion bearings, manganese steel liners. Size: 30" x 18" to 6' x 24'. Denver Equipment.
Dryers 359	Feature modern drives, metal-to-metal seals, complete choice of materials, anti-friction bearings, dependable running gear, functional design, etc. 12 p. Standard Steel Corp.	Mills,, Colloid TR405	Advanced features for uniform grind: improved ball bearings which center shaft & minimize lateral whip; invar shafting with zero coefficient of heat expansion. Admiral Tool & Die.
Dryers 463G	Installation from burner to stack, dependable drives, rugged tires, functional flights, sturdy thrust rolls, positive seals & controlled burners in Bulletin D4-H3. Denver Equipment.	Mills, Grinding BL425	Dry, grind and classify—in a single system—materials carrying an appreciable amount of surface moisture, reducing them to dry, finely-ground products. Bulletin 17-B-11, Hardinge.
Dryers, Rotary TR432	Former disposal problems of waste products transformed into profitable by-products by installing company line of dehydrating equipment. Davenport Machine & Foundry Co.	Mills, Hammer 84a	Heavy duty hammer mills increase output, improve product quality, reduce cost-per-ton. Describes design and construction features. Williams Patent Crusher & Pulverizer Co.
Dust Collectors 168	Equipment solves problems posed by dusts of all kinds, fly ash, chemical fumes, gases of any temperature, aerosols, & other troublesome air polluents. Catalog A-653. R. C. Mahon.	Mixers 123a	Catalogs cover laboratory mixers, portable mixers, top entering mixers, etc. Data on impeller selection, sizing, best type of vessel, installation & operation hints. Mixing Equipment.
Dust Collectors 280G	For the effective removal of nuisance and toxic dusts raised during hopper loading or other handling or feeding of dry chemicals. Offer Publication TP-2-M. Wallace & Tiernan.	Nozzles, Spray 463J	48 p. illustrate and describe thousands of standard and special industrial spray nozzles. Also includes data on related equipment. Catalog 24. Spraying Systems Co.
Dust Collectors RR416	Remove nuisance, toxic and hazardous dust thereby reducing equipment maintenance, increasing productivity, improving quality of product, etc. Illustrated. A. W. Banister.	Pelleters, Continuous 18	Produce top-quality pellets in tremendous vol- umes at reasonable investment & low operating cost. Large & small pellets—even 1" cubes— in many shapes & sizes. Sprout-Waldron.
Dust Collectors, Cloth Bag 457	Tells how dust control for all types of finely divided dry dusts can be provided for smaller volume applications at low equipment & installation costs. Bulletin 916. Pangborn Corp.	Prebreakers 376b	Literature offered on prebreakers for coarse reduction of large-size, extra-tough & hard-to- handle materials. Compact, low speed, low power. Positive-breaking action. Rietz Mfg.
Dust Control 125	Dust control equipment solves problem of collecting valuable dusts—or controlling harmful dusts. Includes pertinent technical information in Bulletin 800. Dracco Corp.	Presses, Filter 16	Size & design for every industrial filtration need. For use with filter bases of cloth, paper, metal screens, etc. Offers choice of 6 different closing devices. D. R. Sperry.
Dust Filters 361	Reverse jet cleaning permits the use of more efficient filter media which gives filtering efficiencies up to 99.99+%. Offers new data on dust control in Bulletin 528. Day Co.	Presses, Filter 387a	Applicable for almost any filterable material. Capable of recovering solids, clarifying, 'extracting, washing, thickening, redissolving, melting. Offer Catalog 52, T. Shriver.

Technical Literature, cont . . .

Processing Equipment, Chemical 464A	Capacities, sizes, HP requirements, design and operating features for grinding mills, disc & drum filters, crushers, slurry agitators, samplers, dryers, etc. Denver Equipment Co.		
Pulverizers 292B	New line of screen hammer-type pulverizers for medium fine grinding. Feature compact design & accessibility for inspection, maintenance of changing screens. Bulletin 73. Raymond Div.		
Refiners, Verticle Single Dise 464B	Offer greater efficiency, greater savings in space at low initial cost, low operating cost, selective refining, long life, etc. Includes application data. Jackson & Church Co.		
Screens, Vibrating L430b	Vibrating screens feature two bearing drive, low horsepower, all steel construction. Size 1' x 3' to 6' x 14'; 1, 2, 3 or 4 decks. Technical bulletin Denver Equipment.		
Separators 464C	Feature long screen cloth life, less floating dust, no substructure vibration, low upkeep, clean separation & accurate sizing, greater capacity, etc. Illustrated Catalog. SWECO.		
Bifters 45a	By utilizing stacked decks, this space-saving unit provides screening area equal to that of a single deck screen needing 4 times the floor space. Bulletin 06B7625A. Allis-Chalmers.		
Stills, Water TL407	Details & specifications on steam heated stills up to 250 gal. per hour; electrically heated type up to 10 gal. per hour; gas heated up to 50 gal. per hour. Consolidated Mach.		
Strainers, Fine Screen BL420	Stop rust, scale, dirt from clogging mechanical equipment. Screens of woven Monel wire, bodies & screen caps cadmium plated. In 10 sizes—¼' to 3". Bulletin S-203. Yarnell-Waring.		
Water Softeners, Zeolite 444D B-1. Hungerford & Terry, Inc.			
Wire Data on advantages of industrial wire clinch includes full range of wire cloth available, rication facilities & valuable metallurgical formation. Cambridge Wire Cloth.			
Wire Cloth 391 Make wire cloth accurately woven from mercially used metals in sizes rangil inches (space cloth) to 400 mesh. new Catalog E. Newark Wire Cloth.			

Pumps, Blowers, Compressors

Blowers & Pumps 229a	Keeps pace with new equipment to handle gas and air effectively, economically. Covers Spiraxial compressors, rotary positive blowers, pumps, etc. Roots-Connersville.				
Calculators, Vacuum 311b	For rapid slide-rule calculations. Includes a standard ABCD log scale. Helps to determine the proper pump to be installed for specific process. F. J. Stokes Machine.				
Compressors 51	44 p. on how & why compressors assure trouble free performance at minimum operating cost Data on design, motor & drives, etc. Bullett M-70. Cooper-Bessemer.				
Compressors 429	Engineered for continuous, heavy-duty usage- assure complete dependability with low opera- ting cost. Require minimum attention & upkeep. Bulletin 725. Chicago Pneumatic Tool.				
Compressors 464E					
Compressors 464 F	Offer long life & constant performance. No internal wearing parts, no valves, no pistons or vanes & no internal lubrication. Compact & low in maintenance cost. Nash Engrg. Co.				
Compressors, Centrifugal 99	Offers complete line of centrifugals for gas compression and refrigeration—up to 10,000 hp in a single unit. Details in "Centrifugal Compressors for Industry." Carrier Corp.				
Pans 94	Excellence of engineering offers trouble-free satisfaction and long life for all types of fans. Makes available literature on specific air handling problems. Buffalo Forge Co.				
Motor- Pumps 464G	Self-priming, portable, close-coupled motor-pump units deliver 600 gph at 10 ft. head; 270 gph at 50 ft. head maximum. Design & performance features in Form 0253. Jabsco Pump.				
Pumps 309	Corrosion-resistant pumps with increased size & capacity range. New CNG Worthite pump in 21 sizes, \$\frac{\pi}{2}\$ to \$\tilde{e}"\$, up to 2000 gpm. Heads up to 200 ft. Bulletin W-350-B14. Worthington.				
Pumps, Contrifugal 79a	Company provides literature describing advan- tages and use of corrosion-resistant pumps for an extremely wide range of applications. Cata- log 253 available. Tri-Clover Mach Co.				

Pumps, Centrifugal 401	Handie corrosive liquids. Now available in 8 dinerent materials. Data on these new materials, performance curves, specifications & dimensions. Bulletin 725.3. Goulds Pumps.						
Pumps, Centrifugal	Covers centrifugal & turbine type pumps. Selection table shows quickly how many gpm each type of pump will deliver under various head capacities. Illustrated. N. Y. Air Brake.						
l'umps, Centrifugal 323	No leakage or contamination of fluids seals- in expensive, toxic, or corrosive fluids pro- tects plant & personnel. Available in from i to 3 hp. Bulletin G-1000. Chempump Corp.						
Pumps, Centrifugal 4641	Describes Buna N & natural hard rubber pumps, valves & pipe fittings. Data on performance, properties, chemical resistance, specifications. Illustrated. Vanton Pump & Equipment.						
Pumps, Centrifugal 464J	Offer mechanical seal with enclosed coolant, rugged type SN armored connections, interchangeable parts, wide capacity range, etc. Catalog Section S-7250. National Carbon Co.						
Pumps, Chemical 352	Corrosion-resisting, heavy-duty chemical pumps for long, trouble-free service. In 12 standard alloys to provide best service in various corrosive conditions. Bulletin P/1. Duriron Co.						
Pumps, Double Suction 341	Rugged double suction pumps assure long life & low maintenance. Offer heavy duty construction, wide material choice, unit responsibility, etc. Data in Bulletin 08B6146. Allis-Chalmers.						
Pumps, High Vacuum 311a	Cites examples of typical vacuum systems using high vacuum pumps and provides solutions to various problems in pump selection in fully revised brochure. F. J. Stokes Mach.						
Pumps, Jet 25	Use steam, water, air or gas under pressure to transfer or mix, without clogging, any liquid which will flow thru pipes. Data on complete line in Bulletin 512. Penberthy Injector Co.						
Pumps, Piston- Diaphragm 164	For controlled-volume pumping of fluids. Flow charts, applications, description & specifications of models of various capacities & constructions. Bulletin 300. Lapp Insulator.						
Pumps, Plastic 464K	Data on self-priming plastic pumps. Will pump thin & viscous fluids—operate at low speeds, or speeds up to 1750 rpm. Details in illustrated Form 3010A. Jabsco Pump.						
Pumps, Piastie 464L	Designed to handle highly corrosive fluids & abrasive slurries. Includes cutaway illustrations, applications, performance data, specifications, etc. Vanton Pump & Equipment.						
Pumps, Proper- tioning 107	For additives or chemical reagents. Meet most requirements for low capacity medium pressure chemical feed pumps. Durable, compact, inexpensive. Bulletin 1105. Proportioneers.						
Pumps, Proportioning 464M	Simplex & duplex reciprocating plunger pumps for pressures to 20.000 pounds & capacities from a few cc per min. to over 900 gals. per hr. Bulletin P-1153. Phila. Pump & Machy.						
Pumps, Rotary TR425	Feature fast, smooth priming and constant, even discharge of liquids from beginning to end. No sudden jar and spasmodic delivery. Complete details in Bulletin 54SC. Viking Pump.						
Pumps, Rotary 161a	Rotary gas ballast pumps help solve water vapor problems and maintain fast pump down time. New bulletin includes principle, construction and operation data. National Research Corp.						
Pumps, Rotary Liquid 385	For positive displacement pumping at its best. Available in iron, steel, or bronze constructions, with displacements from 20 to 2700 GPM. Details in Bulletin L-51. Kinney Mfg.						
Pumps, Sand 464N	Capacities, dimensions, hp requirements, operating features & applications described. Handle frothy, abrasive pulps without difficulty. Offer Bulletin P16-B5. Denver Equipment.						
Pumps, Screw BR418	External gear and bearing bracket type for non- lubricating fluids. Materials and construction adapted to meet any requirements. Bulletin SE-5. Sier-Bath Gear & Pump Co.						
Pumps, Self- Priming 4640	Feature many advantages; instantly self-priming; only I moving part; gearless; quiet; reversible; self-lubricated; wider range of speeds. Offers Illustrated Form 0153-A. Jabsco Pump.						
Pumps, Single Suction 30	Oversize bearings handie severe strains & mean greater maintenance savings. Enclosed impellers, accessible construction, interchangeability of parts. Bulletin 976D. Buffalo Pumps.						
Pumps, Sump 464P	Close-coupled vertical turbine pumps meet conditions in existing sumps as well as in new construction. Head & capacity tables, dimensions, etc. in Bulletin 1029. Johnston Pumps.						
Pumps, Vacuum 311c	Valuable suggestions on installation, starting, servicing, trouble-shooting; & helpful "do's" & "dont's" on vacuum pumps & vacuum pumping systems. Bulletin 755. F. J. Stokes Mach.						

Designed to handle molten sulphur. Steam jack-eted discharge pipe keeps molten materials from solidifying. Operate efficiently at slow speed of 1750 rpm. Bulletin V-837. Taber Pumps.

Instruments & Controls

Air Pollution 305	Instrumen High In ance In 465	
Air Pollution 9~4	Pin-pointing sources of toxic air contamination and continuous, automatic recording of varying concentrations of sulfur compounds. Bulletin CEC-1810B-X6. Consolidated Engrg.	Instrumen Process Control 465
Amplifiers, Transductor Magnetic 400A	Developed for instrumentation, metering, and control of d-c currents and voltages requiring isolation. Data on operation and applications. Booklet Tb52-601. Westinghouse.	Measurem Liquid Level 465
Analyzers, Gas 465B	Liston-Becker analyzers & Brown Electronik recorders provide continuous, positive infrared analysis and control of plant streams. Data Sheet 10.15-10. Minneapolis-Honeywell.	Meters 465
Bulbs, Resistance Thermometer 405C	Data on resistance thermometer bulbs of high speed, marine, room temperature and sanitary types, for temperature spans as narrow as 20F. 15 p. Catalog 5701. Minneapolis-Honeywell.	Meters 383
Calibrators, Pneumatic	Describes fully portable pneumatic calibrators for testing & calibrating pressure instruments	Meters, pH

Calibrators,	Describes fully portable pneumatic calibrators
Pneumatic	for testing & calibrating pressure instruments
282A	which operate between 20" H ₂ O & 25 psi, in de-

Cells,	Describes	electric	d/p	cells	for	level	de	flow
Electric d/p	measureme							
465D	formation							

Chambers,	For safe,	accurate si	mulation of	explosions o
Explosion 465E				s of any alti-
	specification	ons, etc. Te	nney Engrg	

L424	For quick, easy determinations of pH, chlori phosphate or nitrate. Covers theory & appli- tion of pH & chlorine control & describes line comparators. W. A. Taylor.	ca-
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Control	Complete systems for continuous, auton	natic
Systems,	pH control of liquids in process including	
pH	ries, industrial wastes, clarified solutions.	Data
465F	Sheet 9.6-5a. Minneapolis-Honeywell.	

Controllers,	Designed	initially	for	resistance	bulb	ther-
Recorder, Nuli Balan	mometry,	but appli	cable	to many o	ther pro	cess s in
465G				nstrument		

Controllers, Temperature		temperature controll	
100a	changed	by turning one sma ffered in Bulletin 102	all knob. Complete
	detaile o	itered in Dunetin 102	b-A. Sarco.

Controllers, Time		automatic				
Cycle 318-9		ure, pressi ergy. Bull				elec-
310-9	tricar en	ergy. Dul	etin sor	os. Iny	IOF.	

Gages 375	For pressure, vacuum or compound service. No gears or teeth to wear out. Cam wiping action keeps contact points clean & smooth. Details in Catalog G-2. Helicoid Gage Division.
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Gages	Offers information on company line of liquid
465H	level gages, valves and specialties for chemica and petrochemical processing. Includes photo-
	and diagrams. Jerguson Gage & Valve.

Gages,	124 p. comprehensive catalog includes p	ressure
Pressure 465I	gages, gage accessories and gage engi information. Also photos, line and dime	
	drawings, etc. Manning, Maxwell & Mo	

Gages.	Features & specifications	
Strain	micrometer instruments for	
465J	gage lengths. Includes ph	
	Bulletin 4207. Balwin-Lin	na-Hamilton Corp.

Gages,	Information on 100% automatic tank gages for
Tank BR424	gaging liquids of all kinds. Gages are approved by the Underwriters' Laboratories. Offers com-
1310134	plete details. Liquidometer Corp.

Gages, Ultrasonic-	Presents	illustrated Folder listing spec applications for ultrasonic-reso	
Resonance 465 K	thickness	gages for measuring thickness Branson Instruments.	

Indicators, Electronic	Measures continuously, with accuracies ±2%, the levels of liquids, viscous fluids, po	tow
Level 355	ders or granular solids. Remote readings corded at distances greater than a mile. Field	re

Indicators,	Describes operations of liquid level	
Liquid	systems using ultra-sonic pulses. Incl	
Level	plication engineering data & installa	
465L	grams. Bulletin S-68. Bogue Elec. Mfg	. Co.

Indicators, Material Level	oners new catalog on material level inidcators. Automatically report levels of materials in bins, chutes, hoppers, etc., control conveyors & filling
BR435	systems, Bin-Dicator Co.

Instruments, Air Velocities R411	where Messure	readings of air velo speed of air flow spray booths, etc. Illinois Testing.	thru ducts

High Imped- ance Input	For source impedances from 0 to 50,000 Includes design considerations, sensitivity, rejection characteristics, etc. in Data 10.0-14. Minneapolis-Honeywell.	BILIN
ance Input 465M	rejection characteristics	0

Instruments,	Standardized & stocked for prompt shipment at
Process	lower prices. Lists flow meters, controllers, re-
Control 465 N	corders, pressure regulators, etc. in 20 p. illustrated Catalog 2. Fischer & Porter.

Measurement.	Features systems for measuring	&c	contr	ollin
Liquid	liquid level. Includes sections	on	mea	usure
Level	ment, transmission & control. Ill	ustr	ated,	24 3
4650	Dullotin 1160 Minneapolis-Hone	VWA	11.	

*****	Dancin 1100. Daniel Prince
Meters 465P	Conveyofio meters weight "non-flowable" materials—like cohesive, fibrous fruits & vegetables—at high flow rates & with great accuracy. Details it Rullette, 550.HAA Omesa Machine.

Meters	Meters	with	simple	counters	to electro	cl switch
383	adapta	than	remote	ferent	systems industrial Neptune	liquids.
	Mercel	more ce	OH ESOU			

Meters,	Unusually compact, utilizing subminiature com-
pH	ponents & printed circuits. Signal to recorder
271	accurate within ±0.02 pH. Feature low mainte- nance. Data File 86-14. Beckman Division.

Meters, Tank TL425a	Any liquids measured from any distance away whether the tank is buried, elevated, ope- closed, vented or under pressure or vacuum Offers Bulletins. Uehling Instrument Co.
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Positioners, Valve	Compact, rugged, easily ance type of positioner valve positioning, Usable	for accurate positive
47	dicator. Bulletin E-3500.	Fisher Governor.

Process	Electron	ik instruments	feature	exceptional	ac-
Control.	curacy,	sensitivity and	durabi	ity. Details	s in
Industrial	Bulletin	15-14. 'Instru	ments	Accelerate	Rte-
262-3a	search."	Minneapolis-Ho	neywell		

Production	Complete line of variable speed drives & 8 auto-
Control,	matic controls assure the right combination to
Automatic	operate machines more efficiently, profitably-
379	automatically. Reves Pulley.

Proportioning, Cellulose	Data on a remote-control system tioning ground cellulose acetate	for propor
Acetate 465Q	Describes complete proportioning of ence TR 53B. Richardson Scale C	cycle. Refer

Pyrometers, Optical 465 R	Describes feaures, principles & method of opera- tion, user maintenance, applications, models & specifications, accessories, etc. in 8 p. Catalog 85. Pyrometer Instrument.

Nuclear 4658	radioactive sensitive element which convenuciear radiation into electrical energy. Da Sheet 10.0-15. Minneapolis-Honeywell.
4005	

Regulating	Describes	line	of electro	nie 1	power	regula	ating
Equipment,	equipmen	t. Incl	udes data	on A	C reg	ulators	, DO
Electronic			magnetic				sup
367	plies, fre	quency	changers.	Sor	ensen	& Co.	

Regulators.	Guaranteed to shut tight when demand for steam
Temperature 186	ceases. Superior design features result in de pendable and accurate operation. Details in
	Builetin T50. Spence Engineering Co.

Scanning	Eliminate high labor costs & human errors from
Systems	scanning & recording. Give accuracy of 0.1%
381	speeds as fast at 1 recording operation per sec-
	ond. Specifications. Telecomputing.

Spectrometers.	Play an important part in scientific	attack or
Analytical	air pollution by positive identification	
Mass	urement of pollutants in air samples.	Bulletin

Spectrometers,	Ideal for routine quality control in chemical
Infrared	laboratories. Includes data on utility, per-
465T	formance, flexibility, specifications, applications

Int	rared 465T	form	ratories. ance, flex	Includes ibility, sp	ecificat		
		etc.	Perkin-E	lmer Corp			
-						 	-

Thermocouples	36 p. reference ma	nual, "Thermocouples & Ac
465U	cessories" lists, w	ith specifications, standard
		all applicable temperature
	ranges. Bulletin 23	35-5. Foxboro Co.

Thermometers,	44 p. covers data on selection, recorders & in	adi-
Remote	cators, pneumatic control, electric control, p	oro-
Bulb	gram control, bulbs, tubing & fittings. Cata	log
ARKV	6769 Minneapolis-Honeywell	

Transmitters.	Data	on	a 201	mbinat	ion 150	0-pai	liquid	line
Flow							umatic	
Signal							truction	an
465.00	Hee i	n Rui	letin	2653	Hagan	COPD		

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Technical Literature, cont . . .

Viscosity Measurement 465A	Ultrasonic systems for continuous viscosity measurement. Covers applications, operation, installation, chara-teristics, benefits, etc. Data Sheet 10.13-2a. Minneapolis-Honeywell.
Wires, Thermo- couple 186B	Provides information on thermocouple and extension wires—sizes, accuracies, chemical compositions, weights and prices. 6 p. Specification Sheet 307. Minneapolis-Honeywell.
A-ray Units 282D	Describes portable X-ray units for industrial radiography. Feature high efficiency, quick set- up, dust and waterproof mounting, light weight, economy, etc. Holger Andreasen.

Alloys,	Discusses in detail cast corrosion-resistant al
Cast High 466C	Discusses in detail cast corrosion-resistant alloys generally used for process equipment in the chemical industries. Shows physical and mechanical properties. Cooper Alloy.
Alloys, Hardfacing	Illustrated, 48 p. catalog describes complete line of hardfacing and build-up rods and electrodes Included are typical applications and properties American Manganese Steel Div.
Alloys, Hardfacing	Superior resistance to corrosive agents, abrasion and galling. Spraywelding method of applica tion quick & economical. Hard-facing Manua 77 & Spraywelder Catalog. Wall Colmonoy.
Coatings, Protective	Use of Bakelite resin coatings results in de- creased maintenance costs, extended service life and many other advantages for industry. Details in Folder VG, Bakelite Co. Div.
Contings, Protective 378	Neoprene based, & provide surface inert & impervious to broad range of corrosives in fume of splash form. Resist acids, alkalies, oils, etc Bulletin 7-55E. Atlas Mineral Products.
Coatings, Protective 421a	Superior protection against strong corrosives Application of coatings to plant structures & equipment results in effective preventive main- tenance. Bulletin MC-6. United Chromium.
Elbows, Long Tangent 160	Offer many advantages: save pipe; often eliminate short nipples and their extra welds; save time and money in lining up and clamping pipe and fitting, etc. Catalog 54. Midwest Piping.
Fabrication, Metal 412	Manufactures metal products for many indus- trial usesfrom complete carbon-black plant- to steel conveyor boxes. Designs, engineers & fabricates to specific needs. Boardman Co.
Fabrication, Plate 322a	Includes information on manufacturing equip- ment, welding procedure qualifications, typica- examples of plate and heat exchanger fabrica- tion, etc. Downington Iron Works.
Faurication, Stainless Steel 454	Specialists in stainless fabrication, with man- power trained, experienced & equipped for the work, increase service life of stainless steel processing equipment. S. Blickman.
Fabrication, Steel & Alloy Plate 466F	Bulletin covers plant data, facilities, material range, scope of fabrication, personnel, engineer- ing service, industries served and experience. Gussett Boiler & Welding.
Fittings, Tube 466G	Complete line of tube fittings for connecting polyethylene & other plastic tubing. Data on advantages, types & sizes, specifications, etc. Bulletin 3025-A. Imperial Brass Mfg.
Insulation, Cellular Glass 466H	List condensed specifications for application in walls, ceilings, floors, roofs, perimeters, etc. Data on physical properties, performance, char- acteristics. Pittsburgh Corning Corp.
Insulation, Pipe	Data on new lightweight one-piece pipe insula- tion. Covers application, thermal resistance, permanence, resiliency, non-corrosive proper- ties, etc. Illustrated. Baldwin-Hill.
Insulation, Pipe 90	Unlike the ordinary pipe insulations, Foamglas insulation stays dry, assuring constant life-long insulating performance and avoiding corrosion of piping. Pittsburgh Corning Corp.
Insulation, Pipe 171	Withstands a soaking heat, indefinitely, up to 1250°F absorbs moisture & dries out without losing efficiency. Includes properties, unit heat loss chart, styles, finishes. Ruberold.
Insulation, Tank 88	Data on efficient, economical long glass fiber insulation. Proven resilient & reuseable—won't absorb moisture. Offers "how-to-do-it" speci- fications. Gustin-Bacon Mfg. Co.
Lend Products 466J	Illustrated, 44 p. comprehensive compilation of data on lead & lead products. Covers lead as construction material, grades, sheet lead, lead pipe & fittings, etc. Federated Metals.
Platinum Cladding 96	Pure platinum—or a suitable precious metal alloy—bonded throughout to a base metal sup- port. Corrosion resistance of platinum available at reasonable cost. Booklet 96. Baker & Co.

Complete modern lachities including X-ray inspection & stress relieving which insure quality control. Equipment in all commercial metals & alloys. Catalog 490. L. O. Koven & Bro.
Material which features tremendous resistance to slags—both basic and acid. Ideal for use in glass melting tanks, where there's extreme heat, corrosive tumes, etc. Carborundum Co.
Corrugated aluminum roofing & siding finding a rapidly increasing market as building material for industrial shops & buildings. Illustrated, 16 p. booklet. Aluminum Co. of America.
For fast, accurate selection of stainless steels. Data on physical or mechanical properties, resistance to corrosion or scaling, machinability characteristics, etc. Crucible Steel.
For industrial roofing & siding. Feature low initial, application, & per-year costs; rust pro- tection of zinc; strength of steel; etc. Offers booklets. American Zinc Institute.
Information on steel casting material selection. Handy reference data on 19 carbon & low alloy grades & 17 stainless & corrosion-resistant grades. Lebanon Steel Foundry.
Corrosion & heat resisting steel analyses chart. A valuable reference tabulation of stainless steel analyses as produced by various manufacturers. Bulletin 333. Globe Steel Tubes.
Will reduce shutdown time & add to equipment life. Features superior corrosion-resistance to sulphuric acids, plating & pickling solutions, mixed acids, etc. Carpenter Steel Co.
Immunity to hydrochloric, nitric & perchloric acids, iodine, bromine, etc. eliminates shutdowns, repairs, lost production time, spoilage, & other costly corrosion results. Fansteel.
Shows resistance to chloride solutions & retains useful strength up to 800-1000F. Other advantages & data on application & fabrication of titanium alloys. Rem-Cru Titanium

Adaptors, Teflon- Jacketed 353c	Easy to handle, single units, combining steel bearing ring for rigidity & resilient core for perfect seal, contained in chemically inert teflon jacket. Bulletin TG-953. U. S. Gasket.
Fittings 247	Master Catalog describes the complete range of products compressed asbestos sheet pack- ings for all purposes, valves, cocks, level gages, synthetic & silicone rubbers. Klinger Corp.
Fittings, Corrosion- Resistant 330	For use with light-wall pipe. Tangential section cuts initial costs & simplifies piping installations. Types, size ranges, dimensions, charts, tables, etc. Horace T. Potts.
Fittings & Flanges, Welding 466M	Illustrated, 50 p. includes welding procedure & data on stainless steel welding elbows, returns, tees, crosses, reducers, lap joint stub ends, laterals, caps, flanges, etc. Tube Turns.
Hose, Metal Flexible 306a	For handling non-searching liquids, gases and powdered or granular solids at low to moderate pressures.—offers flexibility, durability and economy. Catalog 130-R. Flexonics Corp.
Hose, Steam 466N	Describes complete line of steam hose & their uses & covers every type of steam hose applica- tion. Includes data on performance, sizes, weights, etc. Illustrated. Quaker Rubber.
Hose, Water 4660	Covers the many types of water hose available. Includes photos, cutaway sections, tables of sizes, working pressures & weights, etc. in illustrated Bulletin. Quaker Rubber Corp.
Hose, Metal, Flexible 43	Varied applications for flexible metal hose & tubing. Shows how tubing is designed, used & installed. Includes specifications on tubing & flttings. Booklet CC-400. American Brass.
Nozzles, Spray TR424	48 p. industrial catalog offers complete data on thousands of standard and special nozzles for every type of spraying. Includes related equip- ment. Catalog 24. Spraying Systems.
Pipe & Fittings, Aluminum 466P	Where & why aluminum pipe & fittings are used, chief applications, liquids & gases which can & cannot be carried safely, installation, properties, etc. Aluminum Co. of America.
Pipe & Fittings, Glass 316-7a	For full-scale production operations. Strength- ened by end-tempering, & feature corrosion- resistance, non-contamination, transparency, etc. Catalogs EA-1, EA-3. Corning Glass Wks.
Pipe, Fittings & Valves 456	Corrosion-resistant saran lined pipe, fittings & valves offer greater dependability & longer life—assures tight, leakproof joints. Offers detailed catalor. Saran Lined Pipe Co.

DV-			
Pipe Installa- tion, Glass 316-7b	Pipe is easy to install & low in installed cost compared with other corrosion-resistant mate- rials. Available in 6 standard sizes from 1- to 6-inch I.D., inclusive. Corning Glass Wks.	Valves, Speed BL409	Oner superior performance & dependability. No leak speed valves held at 6000 psi for 30 days- no pressure drop registered over test period Bulletin 6152. Autoclave Engineers.
Pipe, Light Weight 467A	Shows typical applications of light-weight lock- seem-spiralweid pipe and fittings. Includes spe- cifications on pipe from 4 to 30" in diameter. Bulletin 507. Naylor Pipe Co.	Valves, Steam- Jucketed 467L	Successfully handle many types of viscous materials. Feature very large jacket space, tight leak-proof seal, protection from grit, etc. Bulletin E-200. Everlasting Valve.
Pipeline Branch Connections 467B	52 p. on problem of making branch connections to highly stressed transmission & distribution lines without interruption of fluid flow. Illus- trated Bulletin 533. Taylor Forge & Pipe.	El	ectrical Equipment
Tubing, Flexible 467C	New plastic tubing offers unusual flexibility and clear transparency. Includes properties, chemi- cal resistance, characteristics, sizes, etc. Bul- letin 66-D. American Hard Rubber.	Control Centers 467M	Advantages of centralized electrical control sys- tems thru use of a. c. motor control centers Covers installations, specifications, construction etc. 24 p. Clark Controller.
Tubing, Flexible 467D	Scientific application of flexible tubing for air, oil, steam, gases, and volatiles. Engineering data on all tubing and couplings. Pennsylvania Flexible Metallic Tubing Co.	Drives, Electric Power 66a	Feature single, compact power unit, effective cooling systems, fingertip control of speed, rugged construction, low installation cost, etc. Catalog C-413. Sterling Elec. Motors.
Tubing, Plastic 164a	Glass-clear, fully flexible & light in weight plastic tubing resists acids, alkalies, oils, greases, certain solvents & water. Presents descriptive Bulletin 77. U. S. Stoneware.	Motors 295	Designed & engineered for more efficient per- formance. Smaller in size, lighter in weight & quieter in operation. Covers many features in Motor Bulletin CE3304. Diehl Mfg.
Tubing & Pipe, Stainless 467E	For corrosion-resistance applications. Offers data on comparative corrosion-resistance of stainless steels to corrosive media in 8 p. Tech- nical Data Card 160. Babcock & Wilcox.	Motors R407	Features power-packed motor that internally gears its speed. Simplify power hookup, save space, eliminate hazards. 4 to 10,000 rpm; 1 to 30 hp. 16 p. U. S. Electrical Motors.
Valves 467F	36 p. covers valves for use on storage tanks & tank cars. Designed for long life, dependability, safe functioning, ease of maintenance & servicing. American Car & Foundry.	Motors 15	Combine maximum strength with tough, chemi- cal-resistant insulation and corrosion-resistant frame and bearing brackets. Offers Bulletin B-2101., Reliance Electric & Engineering Co.
Valves 49	Cast steel valves in gate, globe and check types handle the most severe high-pressure, high- temperature services, as well as sub-zero op- erations. Catalog 20. Chapman Valve.	Motors, Drip- Proof 22-3a	Open—drip-proof motors in NEMA rerate sizes offer: better protection against falling water & debris; long bearing life; quiet operation; etc. Bulletin 51B6210. Allis-Chalmers.
Valves 233a	Illustrated circular on valves available in stainless steel alloys, monel metal, nickel & aluminum; in wide variety of types—globe, gate, check, needle & "Y." Wm. Powell Co.	Motors, Explosion- Proof 22-3c	Valuable information on company line of explosion-proof motors. Feature superior performance in addition to reduced costs for maintenance. Bulletin 51B7286. Allis-Chalmers.
Valves 467G	Latest data on dependable valves, filters & driers for air conditioning & refrigeration industry. Covers automatic expansion valves, water regu- lating valves, etc. A-P Controls.	Motors, Gear 297b	Capacities to 150 hp. Horizontal foot-mounted units—output speeds 780 to 7.5 r.p.m. Vertical flange-mounted units—output speeds 230 to 7.5 r.p.m. Bulletin GMA. Foote Bros.
Valves, Blow- Off 467H	20 p. on blow-off valves for boiler pressures up to 400 lbs. WSP. Includes installation recom- mendations, construction details & prices. Bul- letin B-426. Varnall-Waring Co.	Motors, Synchronous 467 N	Covers construction features of engine-type, low-speed synchronous motors in ratings of 100 hp and larger at speeds of 450 rpm or less. Bulletin 05B8008. Allis-Chalmers.
Valves, Cast Steel 423	New small cast steel valves, sizes ½ to 2", handle high pressures & temperatures. Integral body & yoke made from single casting without threading or welding. Circular 134. Walworth.	Motors, Totally- Enclosed 22-3b	For specially dirty, corrosive or hazardous applications, totally-enclosed, fan-cooled motors feature many cost-saving advantages. Details in Bulletin 51B7225. Allis-Chalmers.
Valves, Chlorine 281	For water-free chlorine gas or liquid up to 300°F. Feature strong, rugged construction, with corrosion-resistant materials used at all critical points. Folder AD 1976. Crane.	Starters 69	Built in wide range of ratings for squirrel-cage wound-rotor & synchronous motors for full reduced voltage reversing or non-revers- ing. Bulletin 1456410B. Allis-Chalmers.
Valves, Control 6	Help solve process control problems. Feature no more leakage, friction, periodic take-up ad- justment, lubrication or replacements. Details in Bulletin 112. Hammel-Dahl Co.	Starters 152	Excellent for use in damp or wet surroundings—protect men, motors, and equipment. Feature trouble-free operation and lower inspection and maintenance costs. Allen-Bradiey Co.
Valves, Control 227	New type of pneumatic operator with ability to sense & position, & with power to operate under sudden load changes. Features accuracy & sta- bility. Catalog LB-1. Condrow Corp.	Switches 328e	Performance & advantages described for various switches. Included are float switches, fluid level switches, flow switches and indicating switches. Revere Corporation of America.
Valves, Diaphragm 4671	Information on pressure balanced diaphragm motor valves stressing application to jet engine test cell fuel lines. Specification Sheet 425. Minneapolis-Honeywell Regulator.	Switches, Explosion- Proof 4670	Information on explosion-proof switches de- signed for use as limits, safeties and inter- locks in explosive atmospheres. Details in illus- trated Data Sheet 84. Micro Division.
Valves, Float TL426	For more efficient liquid level & flow control. Simple in construction, rugged in service, accurate in operation, require less maintenance. Bulletin 101-B. Davis Regulator.	Switches, Mercury 467P	Covers standard designs for use in a-c or d-c industrial & commercial switching applications that provide low force & tilt motion. Data on 5 families of switches. Catalog 90, Micro.
Valves, Cate 347	Offer compact, weight-saving structure of high- quality carbon steel. Bolted bonnet valves in sizes ½ to 2-in.; union bonnet valves in sizes ½ to 2-in. Folder AD-1881. Crane Co.	Switches, Reset 467Q	Data on enclosed reset switch assemblies. Useful in industrial equipment as safety, limit & control switches for applications resulting maintained contact. Data Sheet 69. Micro.
Nickel Iron 327	Designed primarily for the chemical process industries & are recommended for low-cost control of moderately corrosive fluids. Complete details in Bulletin 118. Jenkins Valves.	Transformers 158	Phit substation transformers, both liquid-filled & dry-type, designed to meet distribution needs. In ratines thru 2000 kva, 15 kv & below. Bulletins TU-13 & TU-56. Wagner Electric.
Plug 363	For easy operation long-life service, lasting safety. Will not stick or freeze. Perfect for hard-to-hold fluids. Simple plug adjustment nut climinates sticking. Hanier Oll Tool Co.	Me	chanical Equipment
alves, Polyethylene 467J	Offers data on polyethylene valves for highly corrosive fluids. Includes diagrams, illustrations & specifications on 1" & 2" polyethylene valves. Vanton Pump & Equipment.	Belts, Flat Trans- mission 167R	Describes flat transmission belts and their appli- cations. Lists recommended uses, specifications, construction data, sizes and lengths. Illustrated. Quaker Rubber Corp.
alves, Solenoid Controlled 467K	Information on new 4" directly operated, 4-way valves, with an operating range from 100 to 5000 net, Includes operation features and characteristics in Bulletin 25. Pantex Mfg.	Belts, V 101	Adjustable v-belts easier to couple & uncouple & longer lasting. New link construction offers maximum flexibility for cooler, wear-resistant running. Manheim Mfg. & Belting Co.

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Technical Literature, cont . . .

Belts, V 468A	Lists many features & advantages: 40% increase in hp capacity over standard belts; resistance to shock loads; length stability; sizes. Bulletin 6628. Raybestos-Manhattan.
Couplings, Flexible 468B	Engineered for dependability & long life, Simplified design reduces maintenance. Sizes & types for every service. Offers 20 p. illustrated Catalog. Lovejoy Flexible Coupling.
Drives 297a	Covers company line of drives: Line-O-Power, Bulletins LPB & LWA; Maxi-Power, Bulletin MPB; Hygrade, Bulletin HGB; Worm-Helical, Bulletin WHA. Foote Bros. Gear & Mach.
Expanders, Tube 468C	Includes data on ball bearing condenser tube expanders, rolling & flaring tube expanders, self-feeding hand tube cutters, etc. in 8 p. illustrated Form 402. Gustav Wiedeke Co.
Expanders, Tube 468D	Tube expanders are self-feeding, for power or hand use. Recommended for general boiler work. Includes complete specifications and ordering data in Catalog 57. Gustav Wiedke Co.
Vibration 468E	Data on new vibration isolators for light industrial applications. Includes performance characteristics, construction features, load ratings, dimensions. Bulletin 537. Barry Corp.
Packings Semi- Metallic HR43:	Outstanding semi-metallic packings for stuffing box service on pumps, valves, mixers, etc. han- dling gasoline—water—air—steam—oils—chem- icals. File DPCE, Durametallic.
Reclaimer Systems, Oil L380	Offers information on a simple, economical, efficient method of restoring contaminated lubricating & sealing oil to full value of new oil. Purifier Div., Hilliard Corp.
Scals, Mechanical 374	Solve corrosion and temperature problems. Offer unique properties of tefion: chemical inertness, extremely low friction and high heat resistance. Data in new booklet. Crane Packing Co.
Tools, Industrial 395	Complete industrial tool set for fast, efficient machinery maintenance & repair. Wrenches in- clude every standard size from 4" to 2". Covers 4000 hand & bench tools. Snap-On Tools.
Turbines, Gas 254-5	Feature improved heat balance, elimination of separate boiler facilities, steam supply of up to 120,000 pounds per hour, etc. Technical Arti- cie GER-754. General Electric Co.
Turbines, Mechanical Drive 252-3	Turbines offer cost saving features: combined trip-throttle valve; interchangeable parts; single reservoir for cooling lube oil; etc. Bulletin GEA-4955A. General Electric Co.
Turbines, Solid- Wheel 417	Rugged construction and superior design of solid-wheel turbines result in savings by keeping maintenance costs to a minimum. Details in Bulletin 8-116. Terry Steam Turbine.
Turbines, Steam 468F	Standardization, simplicity of design & inter- changeability result in top efficiency & per- formance. Dimensions, hp selection curves, etc. in illustrated Catalog 500. Dean Hill Pump.

Heating & Cooling

Boiler- Burners 488G	Complete data on product line aids in selection of proper unit for any particular application to high or low pressure heating, power or process steam. Catalog 1021. Kewanee-Ross.
Boiler Feed Water 468H	Up-to-date information on water softening, de- mineralization, dealkalizing, silica removal, hot geolite and chemical softeners. 20 p. Bulletin BFT-11. Hungerford & Terry.
Boilers, Packaged 77	Available for oil, gas and combination oil/gas firing. Sizes 15 to 500 hp, 15 to 250 psl—for heating and processing. Full details included in Catalog AD-100. Cleaver-Brooks Co.
Boilers, Packaged Automatic 330	For light oil, heavy oil, gas or combination gas-oil firing. Sizes to 500 hp; pressures to 250 psi. Covers constructional & operational advantages. Illustrated. Orr & Sembower.
Burners M396	Applications for industrial burners include the production of petrochemicals, hydrogen & many organic & inorganic chemicals. 12 p. Bulletin 2-GE-8. Surface Combustion Corp.
Burnets, Oil 468I	Commercial & industrial burners designed to burn #1 light oil thru #5 heavy oil. More heat with less fuel at less cost. Offers details in Catalog AD-102. Cleaver-Brooks.
Colls. Pipe & Fin 468J	Illustrated, 34 p. with data on design & calculation of pipe & fin coils, heat transfer coefficients for heating or cooling, factors for computing fin coil surfaces, etc. Rempe.
Condensers 384	"Duo-Pass" & "Ollout" remove superheat & keep system free of oil. Balanced wet bulb control gives lowest head pressure operation automatic- ativ. Bulletin III. Niagara Blower.

Condensers 468K	Covers complete line of floor-mounted, direct contact barometric condensers for food, chem- ical, process & pharmaceutical industries, in illustrated Form 9041. Ingersoll-Rand Co.
Coolers 81	Air-quenching coolers offer many cost-saving features—savings on installation, fuel, power and maintenance. Valuable engineering data offered in Bulletin 07B7869. Allis-Chalmers.
Descrators 24	High quality boiler feedwater at extremely low cost. Deliver water with an oxygen content no to exceed 0.005 c.c. per litre. Minimum piping required. Publication 4643. Cochrane Corp.
Exchangers 366	New bulletin describes advantages and cost saving features. Data on the complete lin- of exchangers—outlines dimensions, capacitie and types of services. Whitlock Mfg.
Filters, Condensate De-Oiling 468L	Information on filters for removing oil fron steam condensate so that it may be reused with safety. Economical, saves valuable heat Offers Bulletin DF. Hungerford & Terry.
Generators, Steam R422	Economical & efficient, producing steam for process or heat. Fire-tube (20-600 b.h.p.), Cata log 622-F. Water-tube (200-1000 b.h.p.), Cata log 622-W. Superior Combustion.
Generators, Steam BL416	Offer exclusive, patented Cyclotherm cyclonicombustion principle, Sizes 18 to 500 hp, 15 to 200 psi operating pressures. Save space, fuel maintenance. United States Radiator.
Heat Exchangers 468M	Describes advantages of air-cooled heat exchangers. Includes data on supporting structure, driving equipment and K-Fin sections in illustrated, 8 p. Griscom-Russell Co.
Hent Exchangers 468N	Diversified heat exchanger products grouped for ready reference into chemical, industrial, power plant & marine classifications. Illustrated, 1: p. Bulletin 1000. Davis Engrg.
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To make sure that you don't miss any news that could help you with your job, Chemical Engineering is doing a double take for you. The listings on this and the following page is a repeat of the editorial listings only on chemicals, equipment and services featured last month in the New Equipment and New Products departments. Use the postcard for more information on any item in this list.

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a-Methylstyrene Dimers
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TYPE EV SPEEDRANGERS are electronically-controlled, Thyraton type, adjustable-speed power drives with a wide range of operating speeds and good speed regulation.

SIZES. 1/8 to 11/2 HP with basic speed of 2400 RPM.

SPEED RANGE. Drive speeds are adjustable down to one sixth of the basic speed for continuous duty, 50°C.; down to one twentieth of the basic speed, intermittent duty.

HOW IT WORKS. Single phase AC power is converted by Thyraton type electronic rectifiers to supply a DC variable-speed drive motor. This DC drive motor is of the separately excited type, which inherently has good speed regulation.

STANDARD CHARACTERISTICS are constant torque rating over the full speed range . . . complete control from a compact operator's station . . . infinite steps of speed adjustment . . . smooth starting and good speed regulation.

OPTIONAL FEATURES are jogging, reversing, dynamic braking, wide or special speed ranges and special duty cycles.

electronic variable speed drives



TYPE GY SPEEDRANGERS are electronically-controlled, motor-generator type, adjustable-speed power drives with a wide range of operating speeds and good speed regulation.

SIZES. 2 to 10 HP with basic speeds of 2400, 1750 and 1150 RPM.

SPEED RANGE. Drive speeds are adustable down to one sixth of the basic speed for continuous duty, 50°C., down to one tenth of basic speed intermittent duty.

HOW IT WORKS. Three or two phase AC power is converted by a motor-generator set and by tube type electronic rectifiers to supply a DC variable-speed drive motor. This DC drive motor is of the separately excited type, which inherently has good speed regulation.

OPERATION. The Type GV Speedrangers have the same standard characteristics and optional features as listed above for the Type EV Speedrangers.

MANY TYPES. The DC drive motor for both the Type EV and GV Speedrangers are available with Master Unibrakes, Fluid Drives and any of the five types of Master Georgaphys.

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the corrosion resistance of glass plus the working strength of steel

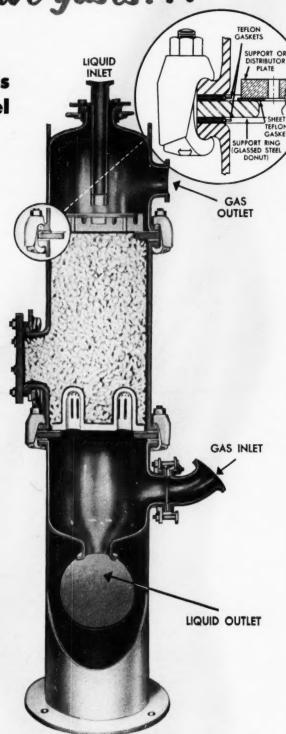
Corrosive gases are even more destructive to process equipment than dilute acids. To help you keep costs down, Pfaudler now offers glassed steel columns to go along with its expanding line of standard and custom-built stills, reactors, heat exchangers and allied products.

Standard Pfaudler glassed steel columns are resistant to all acids (except HF) and also to alkaline solutions up to pH 12 at 212° F. This means almost universal corrosion resistance. It means that you can change a process at any time without being compelled to substitute a column of a different material!

Pfaudler glassed steel columns are built to standard column diameters of 2" to 48". The length of packed sections, the number of support and distributor plates, type of packing, number and size of openings can be varied to suit your requirements. All columns are rated for 25 psi internal pressure and full vacuum, built in accordance with ASME Code Section VIII.

Packing can be dumped in freely without danger to either the glass or packing itself simply by filling column with water. You can remove packing by means of the cleanout opening without dismounting column.

Standard porcelain plates for units 12" diameter and larger are of the gas injection weir type for maximum efficiency and structural strength. For more complete details on this and other Pfaudler process units, write for Bulletin 894-A-3.



THE PFAUDLER CO.



ROCHESTER 3, N. Y.

Pfaudler glassed steel columns in diameters from 2" to 8" are assembled from glass steel pipe sections up to 10 feet in length. Larger columns are made of shell sections and heads, clamped together (inset).